Final Environmental Impact Statement for the Arturo Mine Project

Bureau of Land Management

January 2014

BLM

Elko District Office, Tuscarora Field Office, Nevada

BLM Mission Statement

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Tuscarora Field Office
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Elko, Nevada 89801
http://www.blm.gov/nv/st/en/fo/elko_field_office.html

In Reply Refer To:
3809 (NVE02000)
NVN-87946

Dear Reader:

Enclosed for your review is the Final Environmental Impact Statement (EIS) for Barrick-Dee Mining Venture Inc.'s (BDMV) proposed Arturo Mine Project. The proposed project includes the expansion of the existing open pit, construction of two new waste rock disposal storage facilities, construction of a new heap leach facility, and the construction of new support facilities (i.e. substation and associated transmission powerline, water wells, office, and roads). Mill grade mined material would be transported to Barrick's Goldstrike Mine Facility for processing. No dewatering is proposed for this project. The proposed project would create approximately 2,703 acres of surface disturbance on public land administered by the BLM. The project life is approximately ten years of mining and ore processing and will employ 240 workers. The proposed project is located approximately 45 miles northwest of Elko, in Elko County, Nevada at the previously authorized Dee Gold Mine site.

The EIS analyzes the direct, indirect, and cumulative impacts associated with the proposed mining development activities. The Final EIS has been prepared in an abbreviated format and must be used in conjunction with the Draft EIS issued in January 2013. Together, the Draft and Final EIS constitute the complete EIS. The Final EIS includes responses to comments received during the public review period on the Draft EIS and updates to the Draft EIS.

Following a 30-day Final EIS availability and review period, a Record of Decision (ROD) will be issued. The decision reached in the ROD is subject to appeal to the Interior Board of Land Appeals. The 30-day appeal period begins with the issuance of the ROD.

Copies of the Arturo Mine Project Draft and Final EIS documents are available in the BLM Elko District Office at the above address, and on line at http://www.blm.gov/nv/st/en/fo/elko_field_office.html.

Sincerely,

Richard E. Adams

Richard E. Adams
Field Manager
Tuscarora Field Office

ARTURO MINE PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)

Project Name: Final Environmental Impact Statement
Barrick-Dee Mining Venture
Arturo Mine Project

Lead Agency: U.S. Department of the Interior
Bureau of Land Management
Elko District Office, Tuscarora Field Office
Elko, Nevada

Cooperating Agencies: Nevada Department of Wildlife
Elko County Board of Commissioners

Project Location: Elko County, Nevada

Correspondence on this EIS Should be Directed to: John Daniel, EIS Project Coordinator
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ABSTRACT

This Final Environmental Impact Statement analyzes potential impacts associated with Barrick-Dee Mining Venture (BDVM) proposal for the Arturo Mine Project (Proposed Action). The Proposed Action is to develop the Arturo Mine Project which includes the expansion of the Dee Gold Mine and the construction of new process and ancillary facilities. The proposed project is located in the northern end of the Carlin Trend, approximately 45 miles northwest of Elko, in Elko County, Nevada at the existing Dee Gold Mine site. The proposed Project includes the expansion of the existing open pit, construction of two new waste rock disposal storage facilities, construction of a new heap leach facility, and the construction of new support facilities (i.e., substation and associated transmission powerline, water wells, office, and roads). Mill grade ore would be transported to the existing Barrick Goldstrike Mines Inc. facility for processing. No dewatering is proposed for the Arturo Mine Project. The proposed project would create approximately 2,703 acres of surface disturbance on public land administered by the BLM. The project life is approximately 10 years of mining and ore processing and would employ an average of more than 200 workers. The agency preferred alternative is the Proposed Action.

Responsible Official for Final EIS: Richard E. Adams, Field Manager
Tuscarora Field Office

Executive Summary

Introduction

Barrick-Dee Mining Venture (BDMV) proposes to construct, operate, and reclaim the Arturo Mine Project (Proposed Action/project), which would include development of new facilities and expansion of previously disturbed gold mining areas at the Dee Gold Mine. BDMV is a joint venture between Barrick Gold Exploration Inc., the venture manager, and Marigold Mining Company, a subsidiary of Goldcorp Inc. The proposed project is located on the northern end of the Carlin Trend in Elko County, Nevada, approximately 27 aerial miles northwest of the town of Carlin.

Summary of the Proposed Action

BDMV is proposing an expansion of the existing Dee Gold Mine, which currently is in reclamation and closure. A Plan of Operations (NVN-087946) for the proposed project was submitted by BDMV to the Bureau of Land Management (BLM) in June 2009. The Proposed Action would include expansion of the existing open-pit; construction of two new waste rock disposal facilities (WRDFs) (the East and West WRDFs); construction of a new heap leach pad (Heap Leach Pad No. 12) and gold processing facilities; upgrading and re-aligning segments of the Bootstrap Haul Road, including light vehicle access; construction and/or relocation of support facilities, including office buildings and a communication site; construction and installation of new power transmission lines; and continued surface exploration within the project area.

Mill-grade ore would be transported via the Bootstrap Haul Road right-of-way (ROW) NVN-007683 and processed by contract at the existing Barrick Goldstrike Mines Inc. (BGMI) facilities located approximately 3.5 road miles southeast of the existing Dee Gold Mine. Low-grade leachable ore would be processed on-site at the proposed heap leach pad and associated processing facilities.

The Proposed Action would disturb a total of 2,774 acres, of which 2,703 acres are public lands administered by the BLM and 71 acres are private land. The proposed surface disturbance would include 269 acres of existing disturbance, 543 acres of reclaimed mining disturbance, and 1,962 acres of new disturbance.

Proposed project construction would begin in 2013 pending authorization of permits and approvals. **Depending on mining and economic conditions, mine** operations would begin within **12** months of construction start-up, and would continue for approximately 8 years depending on mining and economic conditions. Ore processing would continue for an additional 2 years beyond the end of mining operations. To the extent possible, reclamation would occur concurrently with mining operations. Final reclamation would be completed during **an approximate** 4-year period following cessation of mining. At the end of mine life, BDMV would reclaim all the facilities associated with the project, except the expanded pit and roads included in the BLM road system **or held by ROWs.** Post-closure monitoring could continue for 30 years or more, depending on the project's final closure plan and its implementation.

Summary of the Project Alternatives

Three alternatives to the Proposed Action were considered for detailed analysis in the environmental impact statement (EIS): the Single WRDF, Partial Pit Backfill, and the No Action alternatives. Five other alternatives were considered but eliminated from detailed analysis.

Summary of Impacts Associated with the Proposed Action and Alternatives

Geology and Minerals

Direct impacts on geologic and mineral resources from the Proposed Action would include: 1) the generation and permanent disposal of approximately 600 million tons (MT) of waste rock and 64 MT of spent ore material; and 2) the mining of proven and probable ore reserves of approximately 2.2 million ounces of gold and 10.6 million ounces of silver.

The construction and operation of the proposed open pit, WRDFs and heap leach pad would permanently alter the natural topographic and geomorphic features over approximately 2,123 acres, including 601 acres of open pit that would not be reclaimed. The WRDFs and heap leach pad would be reclaimed but would alter the topography and geomorphology of the study area. Other temporary facilities including approximately 651 acres of stockpiles, process facilities, ancillary facilities, and haul roads would be reclaimed to the approximate pre-mining topography and therefore would not permanently alter the natural topography and geomorphic features in the study area.

Geotechnical studies and stability analysis of the proposed open pit, WRDF and heap leach facility indicated that the facilities would be stable during construction and operation of the proposed project. Additional geotechnical studies would be incorporated into the final design, operation and maintenance procedures, and closure of these facilities and the process area ponds.

Water Resources and Geochemistry

No perennial stream reaches are located within the study area. Based on the lack of perennial stream reaches, the short reaches of relatively small ephemeral drainages removed by proposed project components, and the proposed storm water management controls; direct impacts to stream flows in Boulder Creek and the Antelope Creek drainage would be minimal. The U.S. Army Corp of Engineers **(USACE)** has concurred that water features in the proposed project area ***within the Boulder Creek drainage*** are not subject to federal jurisdiction, and thus not regulated under Section 404 of the Clean Water Act. **JBR Environmental Consultants, Inc. (JBR) conducted a survey for jurisdictional waters on the 275-acre portion of the proposed project area that drains towards Antelope Creek in the Rock Creek watershed in June 2013. The field investigation found no Waters of the United States in the survey area. BDMV will not disturb drainage features in the Antelope Creek watershed until the USACE has concurred with the JBR findings that the area does not contain potentially jurisdiction streams or wetlands that would be subject to regulation pursuant to Section 404 of the Clean Water Act. BDMV would comply with applicable Clean Water Act Section requirements in the case where the USACE did not concur with the JBR survey findings.**

Twelve seep features would be affected either by burial under proposed project components or by removal of water sources adjacent to the proposed pit expansion. These impacts would minimally affect surface water or groundwater resources, and would primarily involve habitat effects. Springs would not be affected by the Proposed Action.

Mine dewatering would not be required for the Proposed Action due to the influence of pumping at the BGMI facility. Any pumping required to control localized perched groundwater during open-pit mining is unlikely to result in additional drawdown in the carbonate aquifer over that which has been previously predicted and analyzed for the BGMI facility. Dewatering at the BGMI facility is predicted to end in 2021, after which regional groundwater levels gradually would rise. After dewatering ceases at the BMGI facility, the groundwater levels in the carbonate aquifer would rise above the bottom of the proposed open pit and result in the development of three separate pit lakes in the North, South, and East lobes of the open pit. The groundwater model predicts that during the early stages of recovery, local water tables would develop in the Carlin and Vinini formations that represent perched groundwater systems above the carbonate aquifer system. After approximately 200 years of recovery,

the pit lakes are expected to behave as a hydrologic sink (i.e., hydrologic capture zone where there is groundwater inflow that is lost to evaporation and, therefore, no outflow to the groundwater system). **Water quality in the** pit lakes **is** predicted **to** exceed some water quality standards; however, it is anticipated that in the long term (after approximately 200 years), these lakes would not affect the water quality of downgradient aquifers.

The Proposed Action would not affect water rights in the project area.

The WRDFs are designed and would be constructed to minimize the risk of impact to waters of the State and impacts to groundwater and surface water from seepage from the WRDFs are anticipated to be negligible. Soil covers implemented at closure would reduce or eliminate infiltration of water and oxygen. A waste rock management plan provides for a selective waste rock handling program, which incorporates the net alkaline character of waste rock and **approximately 3.5 percent** of potentially acid-generating material for the proposed project.

Because the proposed project would be designed and operated as a zero-discharge facility in accordance with **the Nevada Division of Environmental Protection** mining regulations, impacts from process fluids would be unlikely under anticipated construction and operating conditions. Compliance with interagency closure and reclamation requirements, including monitoring, would minimize the potential for long-term effects on surface water quality after cessation of proposed project operations. Based on these project commitments, no impacts to surface water quality are anticipated from process components under anticipated construction, operating, and closure conditions.

Arturo ore processing at the BGMI facility would be conducted under currently permitted authorizations. As a result, no additional impacts to surface water quality are anticipated from ore processing at the existing BGMI process facilities. Incremental water quality impacts to Boulder or Bell creeks are not anticipated from the Bootstrap Haul Road modification and maintenance.

Cultural Resources

A total of 29 National Register of Historic Places-eligible prehistoric sites that cannot be avoided by project construction have been, or would be, mitigated through implementation of a Historic Properties Treatment Plan **(HPTP)** and in accordance with the Memorandum of Agreement developed by the BLM Elko District Office in consultation with the State Historic Preservation Office (SHPO). There would be an opportunity for Native American monitors to be present during data recovery. The BLM and SHPO-approved **HPTP** would be implemented prior to BLM issuing a notice to proceed. If any previously unknown archaeological sites or human remains are discovered during construction, all construction activities would immediately cease within 300 feet of the discovery, and the BLM Authorized Officer would be notified of the find. Steps would be taken to protect the site from vandalism or further damage until the BLM Authorized Officer evaluated the nature of the discovery.

Native American Traditional Values

In consultation with the Nevada **SHPO** and the Tribes, the BLM would determine whether construction and operation of the proposed project would have an adverse effect on any historic properties of traditional religious and cultural importance to the Tribes. If the BLM determines that historic properties of traditional religious and cultural importance would be adversely affected, mitigation would be proposed. The inadvertent discovery of human remains would follow the procedures stated in the Native American Graves Protection and Repatriation Act. Potential effects to Native American traditional values as a result of the proposed project could include potential damage to archaeological sites, illegal collecting of artifacts, and effects to springs, seeps, and streams. Impacts to archaeological sites from proposed surface disturbance activities have been or would be mitigated according to the HPTP by site avoidance or data recovery. No illegal collecting of artifacts or looting would occur because all of the historic properties located within or adjacent to the study area have been or would undergo data recovery prior to project construction.

Government-to-government consultation is ongoing regarding potential effects to any identified properties of traditional religious and cultural importance and graves/burials and their possible mitigation.

Hazardous Materials and Solid Waste

The transport, storage, use, and disposal of hazardous materials would occur during the construction and operation of the proposed project in accordance with federal, state and local regulations. Based on the facility's design features and the operational practices in place, the probability of a major release occurring at the site or along transportation routes would be low. Any release would be reported and mitigated according to federal and state law.

All hazardous waste generated at the mine would be accumulated and transported to licensed disposal facilities in accordance with applicable federal and state regulations. The proposed project would be classified as a Small Quantity Generator under **the Resource Conservation and Recovery Act.** Non-hazardous solid waste would be disposed of in the proposed Class III waivered landfill located within the proposed West WRDF or other off-site permitted landfill.

Air Quality

Air dispersion modeling results indicate that the proposed project would not exceed state or national Ambient Air Quality Standards for $PM_{2.5}$, PM_{10}, nitrogen dioxide, carbon monoxide, and sulfur dioxide.

No individual hazardous air pollutants (HAPs) would be emitted in a quantity greater than the major source limit of 10 tons per year (tpy), and the combined HAP emissions are less than the major source limit of 25 tpy. Therefore, the Proposed Action would not constitute a major HAP source.

Fugitive and combustion emissions (criteria pollutant emissions) were quantified for hauling ore from the proposed project to the BGMI facility along the Bootstrap Haul Road. Additionally, an estimate of criteria pollutants and HAPs emissions attributed to processing ore from the proposed project at the BGMI facility (under the BGMI existing air permit) was completed. The maximum potential hourly emissions of mercury at the BGMI facilities would not increase due to the processing of Arturo ore, and there would be no projected increases in total annual mercury emissions from the facility.

Paleontological Resources

Destruction, damage, or loss of fossils could potentially occur from general construction activities, waste rock disposal, heap leach facility, and pit development in the Carlin Formation, which has a potential to contain scientifically **significant** fossils, especially vertebrates. **Recent** surveys of the Carlin Formation within the vicinity of the proposed project and **the Cumulative Effects Study Area** have resulted in the collection of **some** recognizable vertebrate fossils.

There is a very low risk of impacts to fossils on previously authorized disturbed lands. Proposed disturbance is not likely to affect paleontological resources in the Paleozoic rocks and alluvium because these rock units have a low potential to contain scientifically **significant** fossils.

Social and Economic Values

The Proposed Action would result in temporary increases in local construction jobs and longer-term increases in mining sector employment primarily in Elko and Eureka counties. The Proposed Action would employ approximately 100 construction workers during the construction phase of the project. The maximum employment impact during construction represents less than 0.4 percent of total employment in the two-county study area.

The Proposed Action would employ an average of more than 200 workers during the operations and processing phase of the project. At its peak, the maximum operations employment effect would be

approximately 659 workers, including indirect employment. The 2016 peak employment during operations would represent a 2.6 percent increase over total 2008 employment in the two-county study area. It would reduce the unemployment rate to approximately 5.8 percent, if all of the jobs were filled by new hires from the local area. No significant capacity or service issues have been identified for public facilities, services, or education in the two-county study area.

The estimated average annual payroll, including benefits, for proposed project salaried and hourly workers combined would be $84,000. Consequently, the direct payroll would range from $4.2 million (2020) to $31.8 million (2016) and would total approximately $159.1 million during the 8-year operating life of the mine. The annual indirect earnings effect would range from $1.5 million to $11.8 million and the total combined effect would be approximately $218.0 million during the operating life of the project. The increase in income earnings would be a substantial economic benefit accruing to the local economy.

The proposed project would generate public revenues primarily from sales and use taxes and net proceeds of mines taxes. BDMV estimates the project would pay sales taxes of $1.4 million in 2013 and $0.8 million in 2014. Estimated sales taxes in subsequent years would range from $39,000 to $179,000, and would average approximately $105,000 per year. Total sales taxes over the 8 year project life are estimated at $2.8 million, divided among the state ($826.000), the school districts ($1,074,000), Elko County ($207,000) and the counties revenue sharing pool ($723,000). BDMV estimates total net proceeds taxes from the proposed project at $34.8 million, ranging from $352,000 in 2013 to $9.8 million in 2020, although with considerable variation over the 8-year mine life.

Recreation and Wilderness

The proposed project would add approximately 1,962 acres to the existing or reclaimed disturbance of 812 acres. The proposed disturbance areas would be removed from public access for recreation purposes for the life of the project. Upon completion of mining, ore processing, closure, and reclamation, approximately 601 acres of disturbed land associated with the open pit would remain unreclaimed, but 2,173 reclaimed acres would be available for dispersed recreation use. Because there is an ample supply of alternative land for dispersed recreation activities in the project vicinity, and because no unique recreation resources would be impacted as a result of the proposed project, effects on recreation resources would be considered minor.

The project area does not contain any land that meets the criteria for wilderness characteristics or designation. There would be no adverse effects from the proposed project on wilderness or wilderness study areas.

Visual Resources

Development of the proposed project would expand the amount of visual contrast that currently exists between existing and previously approved facilities, and the natural character of the landscape. The primary change in visual effects would be the addition of landforms of the West WRDF, East WRDF, Heap Leach Pad No. 12, new mine facilities buildings, and the power transmission line. The proposed project also would extend visual effects through the increased use and activities of the area from the proposed mining activity. The proposed facilities would have visual characteristics during active mining that would be similar to existing facilities, notably a geometric form and exposed earth surfaces. As a result, the proposed project would have similar, but expanded, visual effects to those already occurring from the existing facilities. The visual contrast effects would become less prominent with reclamation.

The proposed project would comply with the Class IV objective during active mining and after reclamation because this objective provides for "management activities, which require major modification of the existing character of the landscape." In addition, public use of travel routes in the viewshed would occur at a low level.

Soils and Reclamation

The Proposed Action would disturb approximately 2,505 acres of soil from areas previously disturbed but reclaimed (543 acres) or new land disturbance (**1,962** acres). Replacement of growth media and revegetation of disturbed areas would be conducted as soon as practical to minimize impacts to soils and vegetation and facilitate post-mining land uses. Impacts would be reduced based on BDMV's commitment to reclaim project components and successfully restore productive post-mining land uses. It is likely that short- to long-term (e.g., up to 10 years or more) decreases in soil quality would not limit the attainment of overall post-mining land use objectives. Over time, soil quality on reclaimed and revegetated sites would resemble pre-mining conditions. A permanent loss of soil productivity would occur on approximately 472 acres of previously reclaimed or newly disturbed land with expansion of the **proposed** open pit, which would not be reclaimed.

Vegetation Resources

The proposed project would disturb approximately 2,774 acres of which 1,960 acres are sagebrush shrublands, 2 acres are riparian zones/wetland areas, 543 acres are reclaimed grasslands from previous mining disturbance, and 269 acres are existing disturbance. The majority of the proposed surface disturbance (approximately 2,173 acres) would be reclaimed with the 601 acres of the open pit remaining unreclaimed post-closure.

The construction of the open pit would affect three wetlands. Widening and realigning the Bootstrap Haul Road would disturb an additional two wetlands where the road crosses the Boulder Creek stream channel. The potential impacts of the proposed project on riparian zones and wetlands would predominantly be long-term, consisting of permanent changes irrespective of post-closure and reclamation success. Mitigation of project-related impacts that would affect 1.6 acres of riparian and wetland vegetation would include the enhancement and restoration of ***36*** acres of vegetation, including three springs, located at an offsite location within the Water Canyon spring complex.

Satisfactory revegetation of disturbance areas is anticipated to occur approximately 3 to 15 years following reclamation. After 25 years, the reclaimed plant communities likely would consist of adequate herbaceous plant cover with sufficient diversity to substantially reduce the potential for soil erosion and provide forage for use by livestock and wildlife.

Noxious Weeds and Non-native Invasive Plant Species

Implementation of the measures outlined in BDMV's applicant-committed environmental protection measures and the proposed reclamation plan and weed management plan would reduce the potential for noxious weeds and non-native invasive plant species establishment in the area. Measures to be implemented to prevent the spread of noxious weeds would include seeding growth media stockpiles as soon as practical with an interim seed mix, using certified weed-free hay and straw, and reclaiming with a BLM- approved seed mix.

Range Resources

The proposed project would exclude 3,333 acres of rangeland vegetation in the Twenty Five Allotment and 24 acres of rangeland vegetation in the T Lazy S Allotment from grazing. Animal Unit Months (AUMs) suspended directly from the proposed project would be approximately 687 AUMs in the Twenty Five Allotment. AUMs suspended based on the proposed project in combination with the current configuration of the Boulder Seeding Fence would total 1,272 AUMs in the Twenty Five Allotment. Long-term impacts would result in the loss of 472 acres and a reduction of 95 AUMs within the Twenty Five Allotment from the expansion of the existing open pit, which would not be reclaimed.

The proposed project would result in the short-term loss of forage during facility construction, operation, and reclamation of the proposed project; and a long-term loss of forage from the expansion of the open pit. The installation of the perimeter fence would result in the loss of forage, restrict cattle

movement, and limit access to water sources. An increase in traffic, especially along the Bootstrap Haul Road, could lead to increased mortality and injuries to livestock, and cause disruptions to livestock management. Vehicle traffic along the Bootstrap Haul Road would disrupt livestock management during seasonal cattle movements between summer and winter grazing areas.

Indirect impacts would include the potential spread of noxious weeds and non-native invasive plant species, and an increase in fugitive dust that could result in a reduction of forage and forage quality. The conversion of native vegetative communities and associated loss of forage could potentially be a permanent change resulting in a long-term impact. Water quality in ponds and reservoirs could be impacted as a result of erosion from construction activities.

Impacts to grazing resources would be minimized through the implementation of applicant-committed environmental protection measures including measures to facilitate cattle movement and to provide additional water sources during seasonal cattle drives. In addition, the existing Boulder Seeding Fence would be reconfigured to reduce the amount of AUMs affected by the Proposed Action.

Wildlife

The proposed project would result in the long-term reduction of approximately 2,505 acres of wildlife habitat, including approximately 1,960 acres of sagebrush shrubland, 543 acres of grassland, and approximately 2 acres of riparian zones/wetland areas. The disturbed habitat associated with the proposed project would be reclaimed following completion of mining activities with the exception of 472 acres of sagebrush shrubland, grassland and wetland associated with the open pit expansion. Mitigation of project-related impacts that would affect riparian and wetland vegetation would include the enhancement and restoration of ***36*** acres of vegetation, including three springs and five pit reservoirs, located at an offsite location within the Water Canyon spring complex.

Indirect impacts would include increased noise, additional human presence, and the potential for increased vehicle-related mortalities. No fish or amphibian species were observed in the three wetlands in the open pit expansion and the two wetlands at the Bootstrap Haul Road crossing over Boulder Creek that would be lost as a result of the project.

The proposed project occurs within **a** mule deer migration corridor. Potential direct impacts to big game (mule deer, pronghorn, and elk) would include the incremental long-term reduction of potential forage and the incremental increase in habitat fragmentation from vegetation removal associated with mine development activities. The project would disturb approximately 1,391 acres of limited use habitat for mule deer, consisting primarily of sagebrush shrubland habitat, and 2,505 acres of summer habitat for pronghorn. Potential direct impacts to elk would include the incremental long-term reduction of approximately 1,940 acres of crucial winter habitat within the study area and approximately 19 acres of low-density habitat. Mitigation of project-related impacts that would affect 1,391 acres of sagebrush shrubland habitat for migrating mule deer would include the enhancement and restoration of important summer and winter mule deer range at offsite locations at a ratio of 1:1. In addition, disturbed areas would be reclaimed as soon as possible to increase the width of the remaining migration corridor and to encourage use by mule deer and other big game.

Direct impacts to small game and nongame species would include the incremental long-term reduction of approximately 2,505 acres of potentially suitable habitat. Impacts also would include displacement from the disturbance areas and increased habitat fragmentation, until reclamation has been completed and vegetation is re-established.

Potential direct impacts to bird species would include the temporary loss of approximately 2,505 acres of potentially suitable breeding, roosting, and foraging habitat. However, this temporary loss is expected to have little effect on local bird populations based on the amount of suitable breeding and foraging habitat in the surrounding area. Additionally, a number of applicant-committed environmental protection measures would be implemented to minimize impacts.

Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals, and the displacement of more mobile species into adjacent habitats. In areas where habitats are at, or near, carrying capacity, animal displacement could result in some unquantifiable reductions in local wildlife populations. Mine-related surface disturbance also would result in an incremental increase in habitat fragmentation at the mine site until vegetation has been re-established.

Applicant-committed environmental protection measures involving erosion and sediment control **Best Management Practices** would be used to reduce sediment input from project facilities and disturbed areas into Boulder Creek, as defined by the site Storm Water Pollution Prevention Plan. By implementing the erosion control measures, project-related impacts of sediment on Boulder Creek and aquatic biota are considered to be minor. No impacts due to water management activities would occur to habitat along Boulder Creek and associated aquatic species.

Special Status Species

Impacts to some special status species would include the long-term loss of approximately 2,505 acres of potentially suitable habitat. Based on the limited habitat to be disturbed and available habitat in the vicinity, potential impacts to these species as a result of the proposed project would be low. A long-term loss of approximately 1,960 acres of potentially suitable sagebrush shrubland habitat would potentially impact some special status species. These impacts would be considered low considering the small amount of disturbance and the availability of similar habitat in the study area. Mitigation of project-related impacts that would affect approximately 808 acres of greater sage-grouse habitat would include the enhancement and restoration of greater sage-grouse habitat at offsite locations at a ratio of 2:1.

Land Use and Access

The project area encompasses approximately 3,627 acres of which 3,551 acres are public lands administered by the BLM and approximately 76 acres are private lands. The proposed project would disturb a total of 2,774 acres of public (2,703 acres) and private (71 acres) land including 269 acres of existing disturbance; 543 acres of reclaimed mining disturbance, and 1,962 acres that would result in new land disturbance.

New project-related disturbance including a new fenced area around the proposed **Plan of Operations** boundary would reduce the amount of land available for livestock grazing and dispersed recreation, although the loss would be small relative to the total public land available for such activities in the project vicinity.

The proposed project would not conflict with the few existing ROWs in the project vicinity. The proposed changes to the existing power transmission line would not adversely affect land use or power availability in the area.

Post-reclamation land use of most of the disturbance area would be returned to open space, grazing, dispersed recreation, and wildlife habitat and would be consistent with local and BLM land use plans and guidelines.

Four categories of traffic would be generated on public roadways by the proposed project including construction traffic, worker commuting traffic, general company and contractor traffic, ore hauling, and material deliveries. Most traffic would access the project site using the Bootstrap Haul Road via SR 766 and Rodeo Flat Road (County Road 237a). Transportation safety concerns related to traffic generated by the proposed project would be minimal. The increase in traffic would be modest, remaining well within the capacity of the roadways. Development of the proposed project would not substantially affect highway traffic in the project region.

Noise

Noise levels substantially higher than ambient background noise levels would be generated in close proximity to the main noise generating activity centers including the open pit, the West WRDF, the East WRDF, the Heap Leach Pad No. 12, and mine traffic along the Bootstrap Haul Road. The noise from blasting would be increasingly reflected upward by the pit walls as the pit depth increased, which would reduce the noise levels outside the pit.

Noise level effects from the proposed project would be negligible as no identified noise-sensitive receptors were identified in the noise effects study area, and relatively modest noise levels were estimated from project-related activities.

Environmental Justice

The environmental analyses indicate that the potential effects of the proposed project would not be expected to disproportionately affect any particular population. The area in the immediate vicinity of the proposed project has no resident population. The nearest residences are a few remote ranches located several miles from the project area that have not been identified as minority or low-income in nature.

Energy Requirements and Climate Change

Greenhouse Gas GHG) emissions associated with the Proposed Action would contribute approximately 80,220 **carbon dioxide equivalent (**CO_2(e)**)** tpy from fuel combustion and 25,901 CO_2(e) tpy from electrical power for a total of 106,121 CO_2(e) tpy of GHG.

The proposed project would emit CO_2(e) that would incrementally add to the GHGs in the region from other sources including power plants, mining activities, industrial operations, vehicle traffic, wildfires, and other activities. The proposed project represents approximately 1 percent of the GHG emissions from all sources in the region, approximately 0.04 percent of the emissions in Nevada, and a tiny fraction of the emissions on a global basis. As a result, the proposed project would be expected to have a negligible effect on climate.

BLM-preferred Alternative

The Council on Environmental Quality Regulations (40 CFR 1502.14e) directs that an EIS "identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference."

The BLM has selected an alternative based on the analysis in this EIS. The preferred alternative is one that best fulfills the agency's statutory mission and responsibilities, considering economic, environmental, technical, and other factors. The BLM has determined the preferred alternative is the Proposed Action.

Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
ACHP	Advisory Council on Historic Preservation
afy	acre feet per year
AGFD	Arizona Game and Fish Department
AGP	acid generation potential
ags	above ground surface
AIRFA	American Indian Religious Freedom Act
amsl	above mean sea level
ANP	acid neutralizing potential
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
ARD	acid rock drainage
ARPA	Archaeological Resources Protection Act
AUM	animal unit month
BAPC	Bureau of Air Pollution Control
BATF	Bureau of Alcohol, Tobacco, and Firearms
BCC	Birds of Conservation Concern
BDMV	Barrick-Dee Mining Venture
BEA	Bureau of Economic Analysis
BGMI	Barrick Goldstrike Mines Inc.
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
BMRR	Bureau of Mining Regulation and Reclamation
BSWSD	Big Smokey Western Shoshone Descendants
BVMP	Boulder Valley Monitoring Plan
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CDC	Centers for Disease Control
Cedar Creek	Cedar Creek Associates, Inc.
CEQ	Council on Environmental Quality

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	Cumulative Effects Study Area
CFR	Code of Federal Register
CH_3Hg+	methylmercury
CH_4	methane
CIL	carbon-in-leach
CN	cyanide
CO	carbon monoxide
CO_2	carbon dioxide
$CO_2(e)$	carbon dioxide equivalent
COPC	constituent of potential concern
CWA	Clean Water Act
dBA	decibels on the A-weighted scale
DWR	Division of Water Resources
EA	Environmental Assessment
ECPLPP	Elko County Public Lands Policy Plan
EIS	Environmental Impact Statement
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ERA	ecological risk assessment
ESA	Endangered Species Act
ET	evapotranspiration
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act of 1976
FR	Federal Register
FY	fiscal year
GBC	Great Basin College
GHG	greenhouse gas
Goldcorp	Goldcorp Inc.
gpm	gallons per minute
GWP	global warming potential
HAP	hazardous air pollutant
HDPE	high density polyethylene
Hg^0	gaseous mercury
HLDE	Heap Leach Draindown Estimator
HPTP	Historic Properties Treatment Plan

HQ	hazard quotient
HUD	Housing and Urban Development
I-80	Interstate 80
IMPROVE	Interagency Monitoring of Protected Visual Environments
IPCC	Intergovernmental Panel on Climate Change
JBR	JBR Environmental Consultants, Inc.
JSA	John Shomaker & Associates, Inc
kg/t	kilograms per ton
KOP	key observation points
kV	kilovolt
LCRS	leak collection and recovery system
L_{dn}	day-night average sound levels
L_{max}	maximum sound level
LOAEL	lowest observed adverse effect level
LOEC	lowest observed adverse effect concentrations
MACT	Maximum Achievable Control Technology
Marigold	Marigold Mining Company
MBTA	Migratory Bird Treaty Act
MC	Maggie Creek
MCL	Maximum Contaminant Levels
MCP	Mercury Control Program
MDL	Method Detection Limits
mg/l	milligrams per liter
mgd	million gallons per day
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRL	Method Reporting Limits
MSA	Micropolitan Statistical Area
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
MT	million tons
MWMP	Meteoric Water Mobility Procedure
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAG	net acid generating
NAGPRA	Native American Graves Protection and Repatriation Act

NDEP	Nevada Division of Environmental Protection
NDETR	Nevada Department of Employment Training, and Rehabilitation
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NNHP	Nevada National Heritage Program
NNP	net-neutralizing potential
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAEL	no observed adverse effect level
NOEC	no observed effect concentrations
NOI	Notice of Intent
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Nevada Revised Statute
NSPS	New Source Performance Standards
NSR	New Source Review
NVCRIS	Nevada Cultural Resources Information System
NVMACT	Nevada Maximum Achievable Control Technology
NWR	National Wildlife Refuge
O_3	ozone
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
PAG	potentially acid generating
Pb	lead
PCPI	per capita personal income
PCS	Petroleum-contaminated Soils
PFYC	Potential Fossil Yield Classification
PGH	preliminary general habitat
PIF	Partners in Flight
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less

$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PoO	Plan of Operations
PPH	preliminary priority habitat
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCG	Rodeo Creek Gold
RCRA	Resource Conservation and Recovery Act
REMSAD	Regional Modeling System for Aerosols and Deposition
RFFA	reasonably foreseeable future actions
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle
s.u.	standard unit
SARA	Superfund Amendments and Reauthorization Act
SH	State Highway
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SPL	Sound pressure levels
SR	State Road
SRA	South Fork State Recreation Area
SRK	SRK Consulting (U.S.), Inc.
SRMA	Special Recreation Management Area
SWCA	SWCA Environmental Consultants
SWPPP	Storm Water Pollution Prevention Plan
TCP	traditional cultural property
TD1	Tailings Disposal Facility No. 1
TD2	Tailings Disposal Facility No. 2
TDS	Total Dissolved Solids
tpd	tons per day
tpy	tons per year
TRV	toxicity reference values
U.S.	United States
USACE	U.S. Army Corps of Engineers

USC	United States Code
USDA	U.S. Department of Agriculture
USDI	United States Department of the Interior
USDOT	United States Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
vpd	vehicles per day
VRM	Visual Resource Management
WAD	weak acid dissociable
WPCP	Water Pollution Control Permit
WRDF	Waste Rock Disposal Facility
WSA	Wilderness Study Area

Contents

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1.0 Introduction

The Final Environmental Impact Statement (EIS) for the Arturo Mine Project (project) presents revisions to the Draft EIS for the Arturo Mine Project dated December 2012. Changes to the Draft EIS are presented in Chapter 2.0 and a record of the written comments received on the Draft EIS with responses to comments is provided in Chapter 3.0. References cited in the Final EIS document are provided in Chapter 4.0.

The Draft EIS was distributed for public comment on January 18, 2013. The Bureau of Land Management (BLM) held a public meeting in Elko, Nevada on February 6, 2013 to educate the public on the project. The 45-day comment period ended on March 4, 2013. The BLM extended the comment period to March 18, 2013 at the request of the United States Environmental Protection Agency (USEPA) to allow additional time for USEPA to submit comments. No members of the public attended the public meeting; however, BLM received 6 comment letters during the period, as described in Chapter 3.0.

None of the comments received during the public comment period required major changes or revisions to the Draft EIS. The Draft EIS has not been reprinted. Therefore, this abbreviated Final EIS must be read in conjunction with the Draft EIS (December 2012).

Changes to the Draft EIS are listed and presented in **Table 2-1.** For reader clarity, revisions to the Draft EIS **Chapter 3.4, Water Resources and Geochemistry,** including updated figures and tables, are presented in **Appendix A**.

The Monitoring and Mitigation Plan for the Project is provided in **Appendix B**. The Monitoring and Mitigation Plan describes the measures agreed to by BLM and Barrick-Dee Mining Venture (BDMV) to mitigate potential impacts from the project, and describes the required monitoring.

2.0 Draft EIS Modifications

This chapter contains specific modifications and updates to the Draft EIS for the Arturo Mine Project that was printed in December 2012. These revisions were made either in response to comments received during the public comment period or where corrections were otherwise indicated during the review.

The Final EIS presents changes to the Draft EIS Executive Summary. Additions to the Draft EIS Executive Summary are shown in ***bold italic*** print. Deletions to the Executive Summary are not shown.

Table 2-1 identifies the text revisions to the main body of the Draft EIS. Where text has been modified or added, the new text appears in ***bold italic*** print. Deleted text appears with a ~~strikeout line~~ through the text. Revised tables from the Draft EIS are presented in their entirety following **Table 2-1**. Additions to the tables are shown as ***bold italic*** print. Deletions to the tables are not shown.

Changes to the Draft EIS **Chapter 3.4, Water Resources and Geochemistry,** are noted in **Table 2-1** by referring the reader to **Appendix A. Appendix A** presents the entire revised section, including updated figures and tables, with additions to the Draft EIS shown in ***bold italic*** print. Deletions to the text are not shown. However, edit lines in the left margin indicate where any change to the Draft EIS was made. Additions to the Draft EIS Table 3.4-5 are shown in *italic underline*. This chapter had more changes in response to comments than other sections of the Draft EIS, and presenting this chapter in appendix format is intended to allow the reader to easily follow the flow of the chapter.

The following general clarifications and corrections have been noted and should be applied to the Draft EIS:

- Electrical or power lines with voltage less than 50 kilovolt (kV) are considered "power distribution lines". Draft EIS text and figures that refer to "power transmission lines" less than 50 kV are hereby corrected to say "power distribution lines."
- Power transmission lines are generally 60 kV in northern Nevada and 69 kV in southern Nevada. Arturo is located in northern Nevada and any Draft EIS text or figures referring to 69 kV power transmissions lines is hereby corrected to say 60 kV.
- The Draft EIS document refers to a proposed "power connection yard" in text and figures. The proper term is "switching station" and the Draft EIS is hereby corrected to replace the term "power connection yard" with "switching station."
- The power provider to the proposed project is "NV Energy." Any reference to "Nevada Energy" or other erroneous company name is hereby changed to "NV Energy."

Table 2-1 Modifications and Updates to the Draft EIS

Draft EIS Section Number	Draft EIS Page	Draft EIS Paragraph[1]	Draft EIS Line	Revised Text
1.1	1-1	1	3-7	…previously disturbed gold mining areas at the Dee Gold Mine. The proposed project is located on the northern end of the Carlin Trend ~~in Elko County~~, Nevada, approximately 27 aerial miles northwest of the ***T***own of Carlin, ***Nevada,*** as shown in **Figure 1-1**. The proposed project is located on public land administered by the United States Department of the Interior, Bureau of Land Management (BLM), Elko District, Tuscarora Field Office.
1-1	1-1	2	1-2	***The proposed project would be located within Townships 36 and 37 North, Range 49 East in Elko County, Nevada.*** The proposed project would be an expansion of the existing Dee Gold Mine, which was operated by the Dee Gold Mining Company under Plan of Operations (PoO) NVN-070250; the Dee Gold …
2.2.3.1	2-5	1	7-10	No. 1-9 and Heap Leach Pad No. 10 is combined and managed through a ~~synthetically lined ET cell and~~ clay lined constructed wetland facility located to the south of Heap Leach Pad No. 1-9. Draindown from Heap Leach Pad No. 11 is managed in a ***system of two*** synthetically lined ET cell located on the northern perimeter of the facility.
2.3.4.6	2-26	1	3	…under existing Barrick Goldstrike Mines Inc. (BGMI) permits and no expansion of BGMI facilities would be necessary. ***The proposed project would potentially contribute approximately 14,000,000 tons of tailings to BGMI's current permitted capacity of 196,400,000 tons of tailings (BGMI 2013).***
2.3.6.3	2-30	1	6-10	…line to accommodate the proposed project facilities. The new power transmission line would be constructed with ***a preference for single*** ~~double~~ wooden poles ranging in height between 65 and 100 feet ags depending on location and terrain. ***The portion of the proposed power transmission line crossing the existing reclaimed TD2 facility would utilize a double wooden pole design. The double pole configuration would allow the poles to be placed farther apart, safely supporting the longer transmission line span without disturbing existing reclaimed TD2.*** The existing substation and a portion of the existing power transmission line would be removed when no longer needed. The vacated section of the power…
2.3.8.6	2-43	4	1-3	Treatment of Outflows, Residual Chemicals, or Fluids in the Heap. As the heap leach pad is stabilized and closed, the long-term heap drainage would be routed to an evaporation cell or an ET cell to further reduce or eliminate the discharge from the system ***in a manner designed to meet regulations and to minimize impacts to birds or other wildlife during the post-closure period.*** The combination of …

Table 2-1 Modifications and Updates to the Draft EIS

Draft EIS Section Number	Draft EIS Page	Draft EIS Paragraph[1]	Draft EIS Line	Revised Text
2.3.8.6	2-44	9	4-7	… time of construction or during the final reclamation period. Unneeded utility poles would be cut off at ground level and disposed of at an approved off-site location or in the proposed on-site Class III waivered landfill. ***NV Energy would maintain the 120 kV power transmission line from the switching station to the proposed project substation until such a time that the power transmission line is no longer needed. NV Energy would remove the power transmission poles and conductors at that time, which may not occur at the same time as the proposed project closure.***
2.3.9.9	2-50	3	3-4	…terrestrial wildlife species. ***The methods employed would be developed in consultation with NDOW during the Industrial Artificial Pond permit process.*** In addition, the heap leach pads would be scarified to minimize ponding and pooling of process solutions.
2.3.9.9	2-50	4	1-4	To minimize raptor electrocutions and collision potential, power transmission lines would be designed and constructed in accordance with Avian Powerline Interaction Committee ***(APLIC)*** guidelines ***(APLIC 2012***~~)~~., ~~including *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* and *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*.~~
2.4.2	2-61	3	5-7	…Backfill Alternative. Keeping the West WRDF footprint the same as that for the Proposed Action ***and decreasing the waste rock capacity under this alternative allows for a lower final slope angle for the facility. While smaller footprint configurations could have been analyzed for the Partial Pit Backfill Alternative, using the same footprint as the Proposed Action was chosen for analysis in order to include potential benefits from the lower angle slope in the analysis such as visual blending with surrounding topography, decreased surface erosion, and more efficient haul truck fuel usage during construction. As summarized in Table 2-12, the Proposed Action West WRDF footprint had previously been redesigned to minimize impact to the Mule Deer migration corridor.*** ~~allows for the decrease in height, which allows for more efficient haul truck fuel usage on the West WRDF construction.~~ **Table 2-16** provides additional …
3.4				Revisions to Section 3.4 are found in **Appendix A**.
3.8	3.8-13 3.8-14	Table 3.8-5 Table 3.8-6		See revised **Tables 3.8-5** and **3.8-6** in this document.
3.8	3.8-13	3	3	…7 miles (approximately 3.5 miles each way). In the analysis, the hauling of 4.47 million tpy of material assumed an average of ***773,013 miles*** ~~27,948 round trips~~ per year.
3.8	3.8-14	4	2	Combustion emission factors for $PM_{2.5}$, PM_{10}, NO_X, CO, and SO_2 were derived from the USEPA's ***MOVES 2010***~~MOBILE6~~ model. The potential fugitive emissions, which include PM_{10} and $PM_{2.5}$, for …

Table 2-1 Modifications and Updates to the Draft EIS

Draft EIS Section Number	Draft EIS Page	Draft EIS Paragraph[1]	Draft EIS Line	Revised Text
3.14.1.2	3.14-10	2	1-4	Of the ephemeral stream channels in the project area, 5 do not extend beyond the project area, while 10 are tributaries of Boulder Creek (JBR 2009). Boulder Creek was confirmed to not be a tributary of Humboldt River as it dissipates approximately 17 stream miles downgradient of the project area (JBR 2009) ***as described in Section 3.4.1.2, Surface Water Resources.***
3.14.4.2	3.14-18	2	1-2	**Issue**: Development of the proposed project would affect ~~12.6~~ ***1.63*** acres of riparian and wetland vegetation.
3.16.2.1	3.16-4	5	1-2	Two range improvements are located within the vicinity of the study area: a cattleguard ~~to restrict pronghorn access~~ and a water well that is not currently flowing. It is anticipated that these range improvements would not be impacted by the proposed project.
3.17.1.2	3.17-2	1	1-2	Population numbers for mule deer in Management Area 6 have shown a general decline over the last ~~10~~***30*** years due to a reduction in winter habitat quality, primarily resulting from wildfires (**Figures 3.2-3** and **3.13-3**). Large scale fires from 1999 to 2007 have caused a severe reduction in available forage …
3.17.3.1	3.17-29	10	3	... BDMV would install BLM-approved fencing around ~~34~~ ***36*** acres of wetland vegetation, ...
3.17.4	3.17-30	2	1-2	BDMV also would repair five pit reservoirs at the Water Canyon spring complex area by dredging sediment from the existing pit reservoirs and installing ***bentonite*** liners at the bottom of the reservoirs to retain water runoff from nearby springs.
3.17.4	3.17-30	9	1-3	Herbicide Treatment – ~~A combination of Imazapic and Glyphosate h~~***H***erbicide treatments would be used to suppress non-native annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas ***in conformance with applicable regulations and the proposed Weed Management Plan described in Section 2.3.9, Applicant-committed Environmental Protection Measures.***
3.17.4	3.17-33	2	2-4	…well as suppress or inhibit the growth of cheatgrass by the use of chemicals means. ~~Herbicide t~~***T***reatments would consist of ***approved herbicide appropriate for both*** ~~the use of Glyphosate in~~ areas where undesirable non-native annuals are dominate, and ~~Imazapic~~ in areas where some perennial …
3.18.1	3.18-1	1	8	…River and the northern end of the Piñon Range (**Figures 3.18-1**~~, **3.18-2**,~~ and **3.18-3**). Similar to the …
3.18.1	3.18-11	2	11-13	…approximately 3.5 miles north of the study area (Miller 2009). While no leks occur within the study area, greater sage-grouse nesting, summer, and winter habitat is found throughout the study area (~~**Figure 3.18-5**~~). Approximately 1,809 acres of undisturbed (i.e., unburned) nesting, early brood, and late …

Table 2-1 Modifications and Updates to the Draft EIS

Draft EIS Section Number	Draft EIS Page	Draft EIS Paragraph[1]	Draft EIS Line	Revised Text
3.18.2.1	3.18-20	2	1	Lewis's Woodpecker, Pinyon Jay, Juniper Titmouse Based on the ~~presence~~ ***absence*** of suitable habitat (e.g., piñon-juniper woodlands) in the study area, direct …
3.18.3	3.18-21	5	2	…shown in **Figure 3.18-1**; the CESA for greater sage-grouse is presented in **Figure~~s 3.18-2 and~~ 3.18-3**.
3.18.4	3.18-24	6	1-3	Herbicide Treatment – ~~A combination of Imazapic and Glyphosate h~~*H*erbicide treatments would be used to suppress non-native annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas ***in conformance with applicable regulations and the proposed Weed Management Plan described in Section 2.3.9, Applicant-committed Environmental Protection Measures***…
4.3.1	4-4			The following Federal Agencies were added to the contact list in the course of preparing this Final EIS. U.S. Department of the Interior, Natural Resources Defense Council – San Francisco, CA U.S. Post Office – Owyhee, NV U.S. Post Office – Mountain City, NV
4.3.2	4-4			The following State Agencies were added to the contact list in the course of preparing this Final EIS. Nevada Governor's Office of Economic Development Nevada State Library – Delamare Library
4.3.3	4-5			The following Elected Officials were added to the contact list in the course of preparing this Final EIS. Mark Amodei, U.S. Representative John Ellison, State Assemblyman, Elko, NV Steven Horsford, U.S. Representative Brian Sandoval, Governor
4.3.4	4-5			The following Local Agencies were added to the contact list in the course of preparing this Final EIS. Lander County Board of Commissioners Lander County School District Mineral County School District
4.3.7	4-7			The following Private Organizations and Companies were added to the contact list in the course of preparing this Final EIS. Elko Daily Free Press Mineral Policy Center – Durango, CO Nevada Mining Association Ormsby Sportsmen's Association Western Lithium Corporation Western Nevada Supply Wind Haven Farm
4.3.8	4-10			The following Individual was added to the contact list in the course of preparing this Final EIS. Dave Pierce

Table 2-1 Modifications and Updates to the Draft EIS

Draft EIS Section Number	Draft EIS Page	Draft EIS Paragraph[1]	Draft EIS Line	Revised Text
Chapter 6		9		~~Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C., and Sacramento, California.~~ ***Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.***
Chapter 6				Barrick Goldstrike Mines Inc. (BGMI). 2010. Boulder Valley Monitoring Plan, ~~Fourth Quarter 2009~~ Second Quarter 2010 and ~~First~~ Third Quarter 2010 Report. Submitted to the Nevada Division of Water Resources, Office of the State Engineer, Carson City, Nevada. BGMI, Elko, Nevada.

[1] Paragraph number includes the first partial paragraph at the top of the page, if applicable.

2.1 Updated Tables

Table 3.8-5 Highest Modeled Air Pollutant Concentrations from the Proposed Action for PoO Area

Pollutant Averaging	Period	Modeling Results ($\mu g/m^3$)	Background Value ($\mu g/m^3$)	Modeled Results Including Background[1,2] ($\mu g/m^3$)	Standard ($\mu g/m^3$)
PM_{10}	24-hour	120.36	10.20	130.56	150
PM_{10}	Annual	23.13	9.00	32.13	50
$PM_{2.5}$	24-hour	20.1	6.8	26.9	35
$PM_{2.5}$[3]	Annual	4.22	2.38	6.60	***12***
SO_2	1-hour	11.98	0	11.98	196
SO_2	3-hour	192.1	0	192.1	1,300
SO_2	24-hour	18.0	0	18.0	365
SO_2	Annual	1.8	0	1.8	80
CO	1-hour	1,720	3,771	5,491	40,000
CO	8-hour	378	1,666	2,044	6,670
NO_2	1-hour	120.22	0	120.22	188
NO_2	Annual	44.38	0	44.38	100

[1] In March 2010, the USEPA issued a guidance memorandum (USEPA Guidance) on "Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS" (USEPA 2010b). The USEPA Guidance recommends that the modeled concentration be added to the monitored "design value." The 24-hour design value is defined as the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentration.

[2] Modeling was not performed for Pb and hydrogen sulfide since emissions of these pollutants from the project are considered to be negligible. Dispersion modeling was not performed for O_3 because O_3 is not emitted from proposed project sources.

[3] ***$PM_{2.5}$ Annual Standard revised January 15, 2013 (USEPA 2013).***

Source: Enviroscientists, Inc. 2012, 2011a.

Table 3.8-6 Estimated Maximum Potential Annual Emissions from Ore Haulage to BGMI – Proposed Action

Source	Pollutant				
	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	NO_X (tpy)	SO_2 (tpy)
Fugitive Emissions	*108.16*	*10.82*			
Combustion Emissions	*0.02*	*0.02*	*0.63*	*0.61*	*0.02*

Source: Enviroscientists, Inc. 2013.

3.0 Public Review of the Draft EIS

The 45-day public comment period on the Draft EIS began on January 18, 2013 and ended on March 4, 2013. The BLM extended the comment period to March 18, 2013 at the request of USEPA, to allow additional time for USEPA to prepare comments.

BLM held a public open-house meeting at the BLM Elko District Office on February 6, 2013. No members of the general public attended. Twelve people signed the meeting sign-in sheet available at the meeting. Attendees included representatives from the local newspaper (Elko Daily Free Press), the Nevada Government Office of Economic Development, a local engineering and consulting firm (Tetra Tech), and local mining companies (Barrick and Newmont). No comments were received during the public meeting.

BLM received 6 comment letters during the comment period. Each letter was reviewed and 82 discrete comments were identified. **Table 3-1** lists each of the comment letters by assigned letter number, commenter, date of receipt, and the number of comments per letter.

Table 3-1 Summary Table of Public Comment Letters

Letter Number	Commenter	Date of BLM Receipt	Number of Comments
Federal Agencies			
F1	Edward Koch, U.S. Department of the Interior, Fish and Wildlife Service, Pacific Southwest Region	March 5, 2013	13
F2	Jared Blumenfeld, U.S. Environmental Protection Agency, Region IX	March 18, 2013	36
	F Letter Total		**49**
Nevada State Agencies			
S1	Lindsey Lesmeister, Nevada Department of Wildlife	February 28, 2013	16
	S Letter Total		**16**
Non-Governmental Organizations and Tribal Organizations			
N1	John Hadder, Great Basin Resource Watch	February 25, 2013	11
N2	Felix Ike, Big Smokey Western Shoshone Descendants	February 27, 2013	5
	N Letter Total		**16**
Private Individuals			
P1	Barbara Leonard	January 22, 2013	1
	P Letter Total		**1**
Total Comments Received			**82**

Comments received during the public comment period are presented on the following pages with a side-by-side display of BLM's response to the comments. Each comment and each response is identified by the letter number and a discrete comment number. Each letter has been reviewed in its entirety and considered by the BLM in preparation of the Final EIS for the project.

Letter F1

RECEIVED
BUREAU OF LAND MANAGEMENT
ELKO DISTRICT OFFICE
2013 MAR -5 PM 4:13

United States Department of the Interior

Pacific Southwest Region
FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

February 28, 2013
File No. 2013-CPA-0033

Memorandum

To: Field Manager, Tuscarora Field Office, Bureau of Land Management, Elko, Nevada

From: State Supervisor, Nevada Fish and Wildlife Office, Fish and Wildlife Service, Reno, Nevada

Subject: Draft Environmental Impact Statement for the Arturo Mine Project

The U.S. Fish and Wildlife Service (Service) has reviewed the December 2012 Draft Environmental Impact Statement (DEIS) for the Arturo Mine Project, which was received on January 17, 2013. The DEIS was prepared for the BLM Tuscarora Field Office by AECOM consultants under a contract with the Barrick-Dee Mining Venture (BDMV). As stated in the DEIS, BDMV proposes to develop the Arturo Mine Project which includes the expansion of the Dee Gold Mine and the construction of new process and ancillary facilities. The proposed project site, the existing Dee Gold Mine site, is located at the northern end of the Carlin Trend, approximately 45 miles northwest of Elko, Nevada, in Elko County. Activities would include expansion of the existing open pit, construction of two new waste rock disposal storage facilities, construction of a new heap leach facility, and the construction of new support facilities (*i.e*,. substation and associated transmission powerline, water wells, office, and roads). Mill grade ore would be transported to Barrick's Goldstrike Mine Facility for processing. No dewatering is required for the project due to on-going dewatering operations at the Barrick's Goldstrike Mine Facility. The proposed action would require the surface disturbance of approximately 2,774 acres, 2,703 of which are on BLM-administered public lands.

The Service's comments and recommendations on the DEIS are provided below pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*); Migratory Bird Treaty Act, as amended (MBTA, 16 U.S.C. 703 *et seq.*); and Bald and Golden Eagle Protection Act, as amended (BGEPA, 16 U.S.C. 668-668d). Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*); and the Fish and Wildlife Act of 1956, as amended (70 Stat. 1119; 16 U.S.C. 742a–742j).

TAKE PRIDE IN AMERICA

Letter F1 Continued

Field Manager File No. 2013-CPA-0033

F1-1 General Comment: The DEIS states the pit lake(s) are expected to be sinks (of water). However, this is not entirely accurate. While there will be pit lake evaporation, there will also be mixing of the pit lake water with the water in the surrounding aquifer. The extent of the mixing will depend on the position of the pit lake(s) in relation to the aquifer (*e.g.*, amount of flow and direction).

F1-2 1.1 Introduction and General Location, p. 1-1: Please provide a legal description in this section.

F1-3 2.3.9.9 Wildlife, Special Status Species, and Livestock Protection, p. 2-50: The DEIS states that "netting, pond covers, or floating "bird balls", as appropriate, would be installed over ditches and ponds that would contact exposed process solutions to minimize potential impacts to Volant and terrestrial wildlife species." There is no mention regarding who will decide what is appropriate or what criteria this decision will be based on. If netting is selected for use, then daily monitoring must be conducted to ensure that the netting itself does not result in wildlife mortality.

F1-4 The DEIS also states that in order to minimize raptor electrocutions and collision potential, power transmission lines would be designed and constructed with Avian Powerline Interaction Committee guidelines. Please utilize the updated reference: "Reducing Avian Collisions with Power Lines: State of the Art in 2012" in preparing the Final EIS.

F1-5 3.1 Chp3, Affected Environment and Environmental Consequences, Introduction, p. 3.1-1: The period for potential cumulative impacts is defined as the estimated 8-year mine life of the project plus the 4 years of reclamation. However, on p. 2-43, the DEIS states that solution management and fluid inventory activities are planned for up to 30 years and that this is a conservative estimate. As long as these activities are on-going, the potential for impacts to birds and wildlife remain, therefore, these potential impacts need to be addressed in the cumulative effects section of the document and include this length of time.

F1-6 3.14.1.2 Riparian Zones and Wetland Areas, p. 3.14-10: The DEIS states that "Boulder Creek was confirmed to not be a tributary of [the] Humboldt River as it dissipates approximately 17 miles downgradient of the project area (JBR 2009)." While Boulder Creek may go subsurface 17 miles downriver of the project area, the water in the Boulder Creek system is still part of the aquifer recharging the Humboldt River, and effects to the Humboldt River (*e.g.*, flow and water quality) should be analyzed.

F1-7 3.17.2.1 Proposed Action, Migratory Birds, p. 3.17-19: The use of netting, bird balls, or covers have been mentioned in the DEIS in order to prevent migratory bird mortalities. However, there is no mention of monitoring to ensure that the netting itself, if selected, does not cause mortality.

F1-8 There is also no cumulative effects analysis for migratory birds in the DEIS. There are numerous other mines mentioned in Table 3.1-1, however, there is no mention of the number of mortalities that have occurred at these sites and which might continue to occur in the future.

F1-9 The

2

Letter F1 Responses

F1-1 As described in Section 3.4.2.1 of the Draft Environmental Impact Statement (EIS), the development of the pit lakes and groundwater flow patterns around the pit lakes were evaluated using the Barrick Goldstrike Mines Inc. (BGMI) regional hydrologic model, a three dimensional numerical groundwater flow model that was refined for this EIS analysis to more accurately represent the hydrogeologic conditions in the vicinity of the proposed pit expansion. The results of the groundwater flow modeling clearly indicate that the three pit lakes that will eventually develop in the post closure period would behave as strong sinks (i.e., hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater flow system) (JSA 2010b). Therefore, the pit lake water is not predicted to discharge into the aquifer system.

No changes have been made to the Draft EIS to respond to this comment.

F1-2 Legal description for proposed project has been added.

F1-3 Text added to wildlife Applicant-committed Environmental Protection Measures in Section 2.3.9.9 of the Draft EIS. The methods employed would be developed in consultation with NDOW during the Industrial Artificial Pond Permit process.

F1-4 The reference has been updated to APLIC. 2012: Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC, Washington D.C.

F1-5 Page 2-43, fourth bullet, text added for clarification: "…to further reduce or eliminate the discharge from the system in a manner designed to meet regulations and to minimize impact to birds or other wildlife during the post-closure period."

No changes to Draft EIS Section 3.1-1 were made in response to this comment.

F1-6 Text has been changed to cross reference Section 3.4.1.2.

F1-7 Text added to clarify wildlife Applicant-committed Environmental Protection Measures in Section 2.3.9.9 of the Draft EIS. The methods employed would be developed in consultation with NDOW during the Industrial Artificial Pond Permit process (Same response as Comment F1-3).

F1-8 Cumulative impacts to migratory birds are discussed in the Wildlife and Aquatic Biological Resources Section 3.17.3 in the Draft EIS. Migratory bird mortality information reported by individual mine sites in the CESA

Letter F1 Continued

Field Manager File No. 2013-CPA-0033

F1-9 Cont water in the process solution ponds has the potential to be detrimental to migratory birds for as long as they remain on the landscape. Solution management/fluid inventory reduction activities, as a conservative estimate, are planned for up to 30 years. As a result, cumulative effects could result for up to 30 years.

F1-10 3.17.4 Potential Monitoring and Mitigation Measures, Mitigation Measure WL-2, Herbicide Treatment: Imazapic and glyphosate products have been identified in the DEIS for use. However, before analysis of effects occur, the actual formulations to be applied need to be identified. The use of glyphosate alone can result in effects ranging from slightly to acutely toxic depending on the formulation used, the species and life stage affected, timing of application, etc.

F1-11 3.18.1 Special Status Species, Affected Environment, p. 3.18-4 & 5: In Figure 3.18-2, greater sage-grouse habitat cumulative effects study area habitat in the project area shows up entirely as winter, late summer, and nesting and early brood habitat. However, in Figure 3.18-3, approximately two-thirds of the habitat in the proposed project area shows up as non-habitat for the greater sage-grouse. The other third is labeled as important habitat. These discrepancies need to be rectified.

F1-12 3.18.2.1 Birds, Greater Sage-grouse, p. 3.18-18: The nearest active lek site is stated as occurring approximately 3.5 miles north of the study area. However, an additional lek site is located approximately 2.5 miles east of the study area based on 2011 Nevada Department of Wildlife GIS data. The last time this site was known to be active was 2007. Even if this site was declared inactive more recently, sage-grouse are known to nest up to 4 miles from a lek site. This distance potentially includes the study area; therefore, direct impacts from the proposed project could occur.

F1-13 We appreciate the opportunity to comment on this DEIS. Please contact me or Kerensa King at (775) 861-6300 if you have any questions.

Edward D. Koch

Letter F1 Responses

F1-8 Cont area is managed by the Nevada Department of Wildlife (NDOW). Currently, a summary of migratory bird mortality data is not available.

No changes have been made to the Draft EIS to respond to this comment.

F1-9 Page 2-43, fourth bullet text added in response to comment: "…to further reduce or eliminate the discharge from the system in a manner designed meet regulations and to minimize impact birds or other wildlife during the post-closure period." (Same response as Comment F1-5).

F1-10 Reference to specific herbicides under Mitigation Measure WL-2 on Page 3.17-30 has been replaced with: "Herbicide treatments would be used to suppress….into the treatment areas in conformance with regulations and the proposed Weed Management Plan described in Section 2.3.9, Applicant-committed Environmental Protection Measures."

F1-11 Draft EIS Figures 3.18-2 and 3.18-5 have been deleted for the Final EIS, the text references to those figures have been struck. The remaining figures in this section have retained the numbering shown in the Draft EIS. The discrepancies noted are due to a comparison of two different habitat classification systems with different purposes. Figures 3.18-2 and 3.18-5 in the Draft EIS are based on the NDOW designated habitat type: nesting, early brood, late summer, and winter habitat. Under the NDOW habitat type system, many of the habitat categories overlap, and non-habitat areas are not comparable with Figures 3.18-3 and 3.18-6. Figures 3.18-3 and 3.18-6 are based on the more recent BLM habitat classification system that includes PPH - Essential/Irreplaceable habitat (NDOW Category 1), PPH - Important Habitat (NDOW Category 2), PGH - General Habitat (NDOW Categories 3 and 4), Non-habitat, etc. The BLM habitat categories are mutually exclusive and do not overlap. In order to eliminate the discrepancies noted on the figures between the two classification systems, the BLM has decided to retain the description of the NDOW habitat classification system in the text for background information, but not display it on Figures 3.18-2 and 3.18-5. As a result, these Figures (3.18-2 and 3.18 5) have been deleted for the Final EIS, and the text has been updated accordingly.

F1-12 BLM reviewed the comment with NDOW and considered updated data. The Draft EIS sufficiently addressed potential impacts to greater sage grouse leks based on current data.

No changes have been made to the Draft EIS to respond to this comment.

F1-13 Comment noted.

Letter F2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

MAR 1 8 2013

OFFICE OF THE
REGIONAL ADMINISTRATOR

Amy Lueders
Bureau of Land Management
1340 Financial Boulevard
Reno, Nevada 89520

Subject: Draft Environmental Impact Statement for the Arturo Mine Project, Elko County, Nevada [CEQ 20130007#]

Dear Ms. Lueders,

The U.S. Environmental Protection Agency has reviewed the Draft Environmental Impact Statement (DEIS) for the Arturo Mine Project. Our review and comments are provided pursuant to the National Environmental Policy Act, the Council on Environmental Quality Regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act; as well as Sections 404 and 402 of the Clean Water Act.

According to the DEIS, the Arturo Mine Project, proposed by Barrick-Dee Mining Venture Inc. (BDMV) is a proposed gold mining operation that would disturb approximately 2,703 acres of BLM lands and would include expansion of the existing Dee Mine pit, construction of two new waste rock disposal facilities (WRDFs), construction of a new heap leach pad, construction of additional new support facilities, and transport of mill-grade ore material to Barrick's Goldstrike Mine facility.

F2-1 The DEIS contains a number of apparent inconsistencies and provides inadequate information to assess the potentially significant environmental impacts of the proposed action. For example, while concluding that the proposed mine expansion poses no risk to water quality as a consequence of zero discharge facility designs, the DEIS also identifies possible waste rock seeps associated with existing Dee Mine facilities that are currently releasing water that exceeds applicable State water quality standards. In addition, based on the Overburden Management Plan appended to the Arturo Mine Plan of Operations, it appears that a substantial amount of infiltration is likely to occur through the waste rock disposal facilities even after reclamation and closure. Given the proposed project design, the limited information regarding the existing Dee Mine features, and EPA's experience with hardrock mines in Nevada, it appears that some mine facilities, such as waste rock impoundments, would result in degradation of groundwater and surface water quality unless additional protective measures are added to the project design. Additional source controls and/or a clearly defined adaptive management approach may be needed to prevent waste rock seepage, heap leach draindown, pit lake infiltration and existing facility leachate from entering adjacent surface or ground water sources and causing water quality violations.

We anticipate that long term post-closure monitoring and mitigation measures will likely be required in

Letter F2 Responses

F2-1 Comment noted.

Letter F2 Continued

order to ensure that the above cited source controls are properly maintained. The DEIS, however, does not contain discussion of long term maintenance and management activities proposed for the project, nor does it provide any projection or estimation of costs for post-closure obligations on the operator, or how the BLM will ensure that these funds will be available for as long as they are needed. Without this information, EPA is unable to fully assess the potentially significant environmental impacts of the proposed project and whether the project might result in a long term financial liability to the federal government and the American taxpayer in the future, e.g., under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Based on this lack of information, EPA has rated the Arturo Mine Project DEIS as "3 -Inadequate Information" (see Enclosure 1: "Summary of Rating Definitions and Follow-Up Action"). Our detailed comments on the DEIS are enclosed (Enclosure 2).

We appreciate the time and effort that you and your staff have devoted to discussing, with EPA, the important larger issues of financial assurance for mining on federal lands. We look forward to continuing the national interagency dialogue on this subject to seek resolution between our agencies on this issue. In the meantime, EPA continues to believe that the adequacy of financial assurance is a
F2-1 critical element to be disclosed during the NEPA process. We believe such disclosure is consistent with
Cont CEQ's guidance.[1]

We recommend that BLM analyze and revise the discussion of potential impacts to water resources; use data from the existing Dee Mine to inform site design and water resource monitoring and mitigation; discuss anticipated mitigation effectiveness; and prepare more detailed monitoring and mitigation plans with established contingencies in the event that unforeseen impacts are identified. The EIS should also disclose an estimate of funding for the reclamation and the closure bond, as well as for the long-term funding mechanism for the proposed Arturo Mine project and should include an analysis of the adequacy of the funding amount and mechanism, including associated uncertainties to ensure that sufficient funds would be available as long as they are needed. The above information should be circulated in a Supplemental DEIS for public comment, in accordance with NEPA and CEQ's NEPA Implementation Regulations. EPA respectfully requests the opportunity to review this information and provide BLM our feedback before you publish the Supplemental DEIS.

In addition to what has been discussed above, EPA has serious concerns regarding the project's air quality impacts, assessment of potential Clean Water Act implications, alternatives analysis and other issues that we recommend BLM address in the NEPA document. Our specific recommendations are provided in the attached detailed comments.

We appreciate the opportunity to review this DEIS and look forward to working with BLM to resolve

1 CEQ, *Memorandum for Federal NEPA Liaisons, Federal, State and Local Officials and Other Persons Involved in the NEPA Process,* Question 19b, (March 16, 1981) states that all relevant, reasonable mitigation measures that could improve the project are to be identified in an EIS and, to ensure that environmental effects of a proposed action are fairly assessed, the probability of the mitigation measures being implemented should also be discussed . CEQ, *Appropriate Use of Mitigation and Monitoring and ClarifYing the Appropriate Use of Mitigated Findings of No Significant Impact,* 76 Fed. Reg. 3843, 3848-3849 (Jan. 21, 2011) may also be relevant. This guidance views a discussion of funding for implementation of mitigation commitments as critical to ensuring informed decision making, and suggests that agencies should not commit to mitigation measures if it is not reasonable to foresee the availability of sufficient resources to ensure the performance of the mitigation.

Letter F2 Continued

the issues outlined in this letter. We will call to arrange a meeting with you to discuss these issues. I have also asked Enrique Manzanilla and his staff to work with your office under the framework of our existing Memorandum of Understanding to better align our mutual expectations regarding what constitutes appropriate NEPA compliance for mining projects in general. In the meantime, if you have any questions, please call me at (415) 947-4238 or have your staff contact Carter Jessop, our lead NEPA reviewer for this project, at (415) 972-3815. Please send a copy of the Supplemental DEIS to this office (mail code CED-2) at the same time it is electronically filed with our Washington, D.C. office.

Sincerely,

Jared Blumenfeld
Regional Administrator

Enclosures:
(1) Summary of Rating Definitions and Follow-Up Action
(2) EPA's detailed comments on the Arturo Mine DEIS

cc: Richard Adams, BLM Elko District Office
John Daniel, BLM Elko District Office
Colleen Cripps, Nevada Division of Environmental Protection
Alan Jenne, Nevada Division of Wildlife
Neil Komze, BLM Headquarters

Letter F2 Continued

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)
The EPA review has not identified any potential environmental impacts requmng substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)
The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

A_DEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts ofthe action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.
*From EPA Manuall640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

Letter F2 Continued

U.S. EPA DETAILED COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ARTURO MINE PROJECT, ELKO COUNTY, NEVADA, MARCH 18, 2013

Existing Dee Mine Facilities

F2-2

According to the DEIS Section 2.2.3.1 Dee Gold Mine, the existing facilities associated with past mining operations disturbed 812 acres. Most of the existing facilities, including waste rock, tailings, and heap leach, have been reclaimed and the bond has been released for earthwork and revegetation; however, closure and reclamation monitoring is ongoing. Page 2-5 states, "The draindown management facilities associated with the reclaimed heap leach pads at the site are monitored in accordance with state Water Pollution Control Permit No. NEV50005 that requires quarterly reporting to NDEP-BMRR." Despite these ongoing monitoring efforts, the DEIS contains little discussion or information related to previously performed reclamation and subsequent closure monitoring. These data would be highly valuable in representing an on-site analog for what might be expected for the proposed Arturo facilities. The existing seeps identified in the discussion of Surface Water Quality data (Table 3.4-5) serve as the nearest source provided for these data; however, based upon the monitoring program described, much more data should be available to the BLM and project proponent. Furthermore, it does not appear that existing waste rock and heap leach facility seepage rates, chemistry, or related information was used to inform the prediction of the likely future effects of the proposed Arturo mine. This information would be very useful, both in terms of predicting possible water quality impacts associated with the proposed action and in terms of anticipating end of mine reclamation efficacy. This comparison of existing on site facilities is a low cost method to predict future effects that should not be overlooked or missed.

> Recommendation: Include additional information on the existing reclamation at the Dee Mine in the Supplemental DEIS. Specific water quality and reclamation efficacy monitoring data should be cited to confirm reclamation effectiveness and protection of water resources. The discussion of potential water quality impacts of the proposed project and its alternatives should make reference to existing on-site facilities and their seepage chemistry and whether or not this chemistry is representative of what should be expected from the proposed expansion.

F2-3

The DEIS identifies a number of existing seeps across the Plan of Operations area. Table 3.4-5 shows the exceedance ofNDEP standards for arsenic, antimony, TDS and pH at sites AR09 and AR36 as well as AR17. In addition, the detection limits for various metals are well above the water quality standards for those constituents and, therefore, the data are insufficient to determine whether there are exceedances. For example, the selenium detection limit indicated is about ten times the Class C surface water quality standard noted. Other metals that have detection limits above the standard provided include copper, cadmium, and lead. It is unclear how the baseline conditions or future impacts can be assessed when the detection limits exceed the standards the measurements are being compared against.

The DEIS goes on to state that the water quality exceedances at AR09, AR17, and AR36 do not appear to have generated concentrations above the Class C reference values in Boulder Creek, citing factors such as the impounded nature of the AR09 and AR36locations, limited flow durations in the project-area tributaries, seepage into channel beds, and dilution from other tributaries to Boulder Creek to explain this (p. 3.4-16). EPA agrees that the present impoundment of the AR09 and AR36 seeps is likely an important component for prevention of impacts to Boulder Creek. We note, however, that the only surface water quality monitoring location in Boulder Creek that occurs downstream of the seeps in question is site BC-AA, which lies over 3 miles downstream and after Boulder Creek's confluence with

Letter F2 Responses Continued

F2-2 Table 3.4-2 has been modified to indicate the potential relationship of seeps to existing facilities.

F2-3 The surface water quality results (Table 3.4-5) reflect standard USEPA analytical methods and the NDEP Profiles I and II orientation required for the state Water Pollution Control Permit and subsequent monitoring programs for mining projects. The analyses were conducted by an NDEP-approved analytical laboratory (SVL Analytical of Kellogg, Idaho). The Method Reporting Limits (MRLs), as indicated by the "less-than" symbol (<) in Table 3.4-5, relate to the NDEP Profile I and Profile II reference values, and are generally one-tenth the reference value, or else three to ten times the Method Detection Limit (MDL). All MDLs used by the laboratory are less than the Class C stream standards with the exception of selenium. As noted on Table 3.4-5, the hardness-based selenium standard is 0.005, assuming a hardness value of 60 mg/l as $CaCO_3$. The MDL is 0.006. Both hardness and the corresponding standard value may vary. In addition, while some MRLs presented on Table 3.4-5 may be greater than the most stringent Class C stream standard, they are well within the NDEP Profile I and II reference values, which form the monitoring basis for the NDEP Water Pollution Control Permit and BLM NEPA analysis.

The water quality analysis follows guidance from BLM Instruction Memorandum (IM NV 2008-32 "Water Resource Data and Analysis Policy for Mining Activities") (BLM 2013a), wherein "Every effort should be made to ensure that the collection of baseline water resource data is coordinated with the State of Nevada Water Pollution Control Permit". This orientation is also encouraged for permitting and NEPA use by additional BLM Instruction Memorandum (IM-NV-2010-014 "Rock Characterization and Water Resources Analysis Guidance for Mining Activities") (BLM 2013b), BLM Memorandum of Understanding with the USEPA (NV EPA MOU 2008) (BLM 2013c), and NDEP and the U.S. Forest Service (NV MOU11.20.08) (BLM 2013d).

The Draft EIS text has been modified to include a discussion of WAD cyanide results in Section 3.4.1.3.

Monitoring is addressed in the Monitoring and Mitigation Plan (Appendix B).

Letter F2 Continued

Rodeo Creek. Absent a monitoring location nearer the project area, it is unclear whether or not surface water quality standards are being violated where these seeps appear to occasionally enter Boulder Creek. Furthermore, the DEIS does not specifically address how this potential contaminated discharge to Boulder Creek will be managed under the proposed project or how discharge will be controlled post closure.

EPA also notes in Table 4.3-5 an abnormal indication of WAD cyanide at site AR09. The presence of WAD cyanide appears to be an indication of a process water discharge, possibly from Heap Leach Pad No. 1-9, that has the potential for discharge into Boulder Creek.

F2-3 **Recommendation:** Include additional discussion regarding the discharges from the existing waste rock dump facilities, which appear to have the potential to impact Boulder Creek, in the Supplemental DEIS. Address the applicability of State requirements for ensuring that this discharge does not enter waters of the State and how these requirements are, and will continue to be, met under the proposed project. Also include long-term monitoring and management measures that will be required in order to prevent the discharge from impacting surface water, post reclamation. Include in the monitoring proposal the installation of a water quality monitoring location in Boulder Creek at the downstream edge of the project area to ensure that impacts are being appropriately identified. In addition, discuss and address the presence of cyanide at site AR09, its probable source, the potential for surface water quality impacts, and what mitigation measures would be employed to prevent additional discharge.

The discussion of the existing Dee Mine facilities does not include information regarding the post-closure requirements for the Dee mine and how the proposed Arturo mine project might inherit and/or affect those obligations. This is an important aspect of the existing facilities and the project site considerations.

F2-4 **Recommendation:** Discuss the existing post closure requirements for the Dee mine facilities, how successful these measures have been, any remaining outstanding issues still to be resolved, and the affect that the proposed project would have *upon* these matters, in the Supplemental DEIS.

Page 3.4-5 ofthe DEIS states that an impoundment located immediately down gradient from the existing Tailings Disposal Facility No. 2. "receives runoff from [TD2] drainage and the nearby watershed." No water quality data are provided for this impoundment.

F2-5 **Recommendation:** Because this water body receives runoff from the existing tailings facility, provide water quality data so that an assessment can be made of existing TD2 seepage chemistry. If no water quality data exist for this impoundment, collect the data or provide a discussion in the Supplemental DEIS explaining why such data could not be collected.

F2-6 The proposed project and action alternatives include the excavation and removal of three reclaimed Dee mine Heap Leach Pads, Pads No. 1-9, No. 10 and No. 11, as well as the rehandling and movement of a substantial amount of waste rock material. The material from the heap leach facilities would be incorporated into the proposed Heap Leach Pad No. 12, while the waste rock material would be placed in one of the two newly proposed waste rock disposal facilities (WRDF). The DEIS describes the

Letter F2 Responses Continued

F2-4 Chapter 2.0 provides sufficient detail on existing closure and post-closure obligations to analyze the proposed alternatives under NEPA. For example, Section 2.3.3 and 2.3.4.4 describe where existing Dee facilities would be relocated or how they would be incorporated in the site engineering for the proposed expansion.

No changes have been made to the Draft EIS to respond to this comment.

F2-5 The text has been revised to clarify the relationship between TD2 and the BLM impoundment located outside the study area. The impoundment does not receive surface drainage or seepage from TD2. No seepage occurs from TD2, and the impoundment receives surface runoff re-directed from the watershed upstream of TD2, via a diversion constructed to supply water from the upgradient undisturbed area to the off-site BLM pond.

F2-6 The existing heap leach pads and waste rock facilities that would be relocated as part of the Proposed Action are described in Section 2.2.3, 2.3.3, and 2.3.4.3 of the Draft EIS. The heap leach pads to be excavated and relocated include Heap Leach Pad No. 1-9 that operated from 1983 to the early 1990s; and Heap Leach Pads No. 10 and 11 that operated in the late 1990s. These facilities were reclaimed and the bond was released for earthwork and revegetation. Monitoring results of the mine site are submitted in annual reports to the NDEP (with copies provided to BLM) in accordance with the Nevada WPCP requirements for the mine. This historic monitoring and performance data for the mine is available for review by interested parties at the NDEP.

BDMV submitted additional information to BLM during the Draft EIS review process regarding flow and water quality monitoring and data collected from the existing Dee Gold Mine (BDMV 2013).

Additional text was added to the Draft EIS Section 3.4.2.1 in the water quality and geochemistry section in response to this and other comments to the Draft EIS regarding the evaluation of closure of the proposed heap leach facility. This additional text includes a summary of the performance of the existing reclaimed Dee Mine heap leach pads on the project site relevant to predicting net infiltration rates and water quality of the effluent for the proposed heap leach facility.

Letter F2 Continued

procedure whereby the existing heap leach pads and waste rock material would be relocated.

F2-6 Cont Recommendation: EPA suggests that the BLM consider requiring an analysis of the heap leach pads and WRDFs to be excavated and relocated as components of the proposed project, prior to and during the removal of these facilities. By comparing actual performance to estimated performance, this work could strengthen the reclamation and closure design for the Arturo project to further protect against the development of unanticipated impacts.

<u>Arturo Mine Water Quality Impacts</u>

Waste Rock Management

The DEIS c-oncludes that minimization of net infiltration into the WRDFs through use of soil covers would provide an effective means of preventing migration of interstitial water from the facility, thereby protecting surface water and groundwater quality. As is evident from the existing seeps noted above, the use of soil covers at the project site has not effectively prevented the discharge of waste rock dump seepage. Nor has the chemistry of that discharge met water quality standards by means of sorption of deleterious constituents in the interior of the WRDF, as suggested elsewhere in the DEIS (p. 3.4-38). EPA believes that a more appropriate assessment would rely on the existing conditions as the best indicator and would conclude that, despite the proposed measures, it is still likely that some seepage exceeding water quality standards for some contaminants will migrate through and discharge from the waste rock facilities and require long-term monitoring and management measures.

F2-7 Recommendation: Include in the Supplemental Draft EIS additional information about the existing waste rock dump seepage and use this information to inform the discussion of future water quality management needs, in particular considering whether some seepage requiring long-term monitoring and management is likely to occur following reclamation. Revise the reclamation and closure plan to reflect long-term water management requirements and address those requirements in sufficient detail so they can be evaluated both in terms of effectiveness and financial assurance requirements. Where uncertainty exists, an adaptive management approach rriay be an appropriate measure to ensure potential sources of contamination are controlled. Additionally, the alternatives analysis in the Supplemental Draft EIS could consider alternative reclamation measures, such as construction of an engineered source control cover designed to limit infiltration, to better control predicted waste rock dump seepage.

F2-8 According to the DEIS Section 3.4.1.4 Rock Geochemistry, Waste rock units classified as "environmentally adverse" contain rock with the potential to become acidic, leach metals, or both. Environmentally adverse rock would account for an estimated 12 percent of the material placed in the WRDFs. Environmentally adverse waste rock would be intermixed with oxidized waste rock and not segregated. This intermixed waste rock material would be underlain and covered by a shell of waste rock classified as oxidized (i.e., non-PAG). The minimum thickness ofthe oxidized (non-PAG) shell would be 25 feet at the base ofthe facility, and 50 feet along the sides and top of the final reclaimed facility. The perimeter shell would ensure that migrating water contacting acid forming rock in the interior of the facility also would encounter acid neutralizing rock in the perimeter shell before exiting the facility (p. 3.4-40).

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Letter F2 Responses Continued

F2-7 Additional text was added to the Draft EIS Section 3.4.2.1 in the water quality and geochemistry section, under the minor heading "Waste Rock Disposal Facilities" regarding estimated long-term flow rates from the reclaimed WRDFs and existing geochemical and groundwater conditions that would minimize mobilization and transport of constituents of concern. The analysis indicates that long-term seepage out of the WRDFs is not expected to impact downgradient groundwater quality. Additional information on the performance of historic Dee facilities was provided to BLM (BDMV 2013). The Monitoring and Mitigation Plan in Appendix B of the Final EIS includes an adaptive management plan.

F2-8 See response to comment F2-7 and Section 3.4 of the Draft EIS regarding the evaluation of potential impacts to water quality in the downgradient carbonate aquifer. The strategy for managing PAG waste rock for the proposed project is modeled after the Bazza and Clydesdale WRDFs, and the pit backfill at the BGMI operation. More than 1.8 billion tons of waste rock was placed in the Bazza facility from the early 1990s to 2009. Approximately 25% of the rock placed in the Bazza consisted of PAG material, which is a much greater proportion of PAG than exists in the proposed project (BDMV 2013). Water quality monitoring has not detected any effect of the Bazza facility on water resources at BGMI. While the proposed shell thickness of non-PAG rock is 25 feet beneath areas where PAG can be placed, an additional several hundred feet of unsaturated soil and rock underlie the WRDF, providing significant vertical separation from the regional water table.

No changes have been made to the Draft EIS to respond to this comment.

Letter F2 Continued

EPA is concerned about the effectiveness of the proposed method, which utilizes intermixing of PAG and NAG material as a mitigation measure. The measure requires sufficient intermixing in order to be successful and has not been proven on a long-term basis. If the intent of the waste rock management plan is to ensure that migrating water contacting acid forming rock in the interior of the facility would encounter acid neutralizing rock in the perimeter shell before exiting the facility, we are concerned by the fact that the thickness of the shell is less thick (25 ft) at the bottom of the pile, where most seepage would migrate, than it is along the sides and top (50ft) where seepage would be unlikely to migrate. EPA recommends the Supplemental Draft EIS clarify how the proposed configuration is determined to be adequate for ensuring environmental adverse material control.

In addition, the waste rock management plan does not present any management strategies for addressing the presence of leachable arsenic and antimony associated with neutral and alkaline pH environments. Although the DEIS concludes that attenuation of these constituents will occur sufficient to prevent migration into the environment, the DEIS does not provide sufficient support for this conclusion given

F2-8 Cont the elevated concentrations of these contaminants in existing waste rock dump discharges observed at seep AR-09 and AR36.

Recommendation: Provide in the Supplemental DEIS:

- A discussion of the reasoning behind the proposed waste rock management plan approach and design, and provide examples of where it has been used successfully, given similar waste rock characteristics (e.g.% ofPAG and NAG)
- Information to support the conclusion that 25 feet of NAG material with the stated geochemistry is sufficient to prevent the release of acidic or adverse leachate.
- A discussion of the likelihood that the WRDFs will release leachate, and provide the range of anticipated flow rates for this seepage.
- A discussion of the potential that waste rock dump seepage will exceed water quality standards for TDS, pH, arsenic, antimony and other constituents relative to the existing waste rock dump seepage, and that, in both cases (existing and future), long-term monitoring and water management to avoid discharges will most likely be required.

According to the DEIS Section 3.4.1.4 Rock Geochemistry, the WRDFs are sited and designed to minimize the risk of impact to waters of the State. The DEIS states that the WRDFs would be closed utilizing a closure design found to be highly effective at the Barrick Goldstrike Mining Inc facility. This closure design involves shaping the facility to a geomorphically stable configuration, placing a soil cover that incorporates high water holding capacity and includes capillary breaks to reduce net infiltration, and establishment of perennial vegetation to meet post-mining land use objectives (p. 3.4-42). Page 3.4-42 contains the only mention of capillary breaks as part of the cover design that EPA could find in the DEIS. Elsewhere, cover design is described simply as 2 feet of cover material with a

F2-9 soil cap. EPA believes that capillary breaks can be an effective part of a cover system that minimizes infiltration, provided they are properly designed and long-term performance and maintenance considerations are addressed.

Recommendation: Consistently describe the capillary break as part of the cover system, and provide additional information as to the particular design of the capillary break, its anticipated performance, and any long-term performance issues and/or maintenance requirements in the Supplemental DEIS mitigation and reclamation and closure discussions. A comprehensive analysis would include examination of the existing Dee facility caps and the BGMI caps

Letter F2 Responses Continued

F2-9 The text was modified for clarification and consistency. BDMV provided additional information on capillary barrier effects and performance of similar covers at nearby BGMI operations in response to comments on the Draft EIS (BDMV 2013a). An updated Waste Rock Management Plan (Schafer 2013) was submitted by BDMV after publication of the Draft EIS that provides additional information regarding the anticipated performance of the proposed cover system.

Letter F2 Continued

F2-9 Cont mentioned to assess cap performance in relation to future cap design at Arturo. In addition, the reference to new reclamation practices employed at the BGMI facility to reduce infiltration should be expanded upon, including data on the real world effectiveness of the infiltration control methods, realistic infiltration percentages based upon the best available data, and the likely seepage volume that the WRDFs could be expected to release in the post-closure period.

Page 3.4-42 states that, "Toe seepage may be observed during the operational phase due to the potential preferential flow, snowmelt infiltration and surface water runoff from the sloped area." Monitoring and Mitigation measures SW-2 are proposed to mitigate this potential impact (p. 3.4-57). The DEIS concludes that the measures proposed would "effectively mitigation impacts to water quality" and no residual impacts are anticipated. More information is necessary to support this conclusion, however, given the uncertaintyr garding where toe seepage may occur, what control measures would be necessary, what the expected seepage water quality would be, what additional treatment methodologies might need to be implemented, and a project site history that includes some contribution of mine seepage into Boulder Creek. While the discussion of mitigation effectiveness indicates that "methods to capture, control and treat small amounts of toe seepage from WRDF are well known and easily implemented" EPA notes that there are many examples where these same treatment methodologies have been unsuccessful.

F2-10 The proposed mitigation measures for water quality control do not include any provision for potential impacts to water quality after reclamation activities are complete. The DEIS does not provide adequate data to support the assumption that no seepage will be released from the reclaimed facilities, particularly in light of the existing seepage at the site.

Recommendation: Include additional details regarding the mitigation measures proposed for control of waste rock seepage in the Supplemental DEIS. Discuss likely treatment and control methodologies and, where applicable, provide specific examples of where these measures have been effective at other mines. Discuss existing site seepage water quality in the context of waste rock seepage mitigation and the ways in which existing water quality data does or does not inform future mitigation design.

EPA recommends the use of an adaptive management planning approach to address changing operational and water quality conditions, and inclusion of a contingency plan for additional for water management (and/or treatment) facilities should release of contaminants occur after project cessation and reclamation. For example, the waste rock dumps could be constructed on a compacted clay liner or other barrier to limit infiltration to groundwater. An ET cell could be constructed at the toe of the WRDFs at such time seepage is observed to minimize migration to surface and groundwater.

Heap Leach

F2-11 The DEIS Section 2.2.3.1 discusses the three help leach pads constructed and operated and reclaimed in association with the Dee Mine. During reclamation, process ponds associated with the heap leach pads were converted to draindown management facilities. Draindown from Heap Leach Pad No. 1-9 and Heap Leach Pad No. 10 is combined and managed through a synthetically lined ET cell and clay lined constructed wetland facility located to the south of Heap Leach Pad No. 1-9. Draindown from Heap

Letter F2 Responses Continued

F2-10 Proposed monitoring and mitigation requirements for any seepage that occurs along the margin of the WRDFs were provided in Section 3.4.4.2 of the Draft EIS. See the Monitoring and Mitigation Plan in the Final EIS (Appendix B). In summary, Monitoring Measure SW-2 would require BDMV to develop a plan to identify, monitor flow rates, and collect and analyze leachate for any toe seepage identified along the margin of the WRDFs. The plan would determine if the sampled water quality exceeds applicable water quality standards established by NDEP under the state Water Pollution Control Permit. The monitoring would be evaluated by NDEP and BLM and would be used to trigger mitigation if necessary. Mitigation Measure SW-2 would require the development of NDEP approved site-specific mitigation plans designed to capture, control and treat the effluent; and to monitor and verify mitigation effectiveness to control and treat toe seepage as necessary to prevent potential impacts to water quality. The actual measures that would be implemented if necessary would depend both on the flow rate and water quality parameters observed. Regardless, the seepage would be managed in accordance with a variety of NDEP approved methods (that may include collection pipes, lined ponds, evaporation cells, ET cells, or water treatment). The Monitoring and Mitigation Plan in Appendix B of the Final EIS includes an adaptive management plan.

The Draft EIS included an evaluation of the potential effects associated with the reclaimed WRDFs. The results of the analysis and supportive geochemistry studies incorporated by reference in the Draft EIS do not support the need for additional contingency plans suggested by USEPA.

No changes to the Draft EIS were made to address this comment.

F2-11 BDMV submitted additional information to BLM during the Draft EIS review process regarding flow and water quality monitoring and data collected from the existing Dee Gold Mine (BDMV 2013). Additional text was added to the Draft EIS Section 3.4.2.1 in the water quality and geochemistry section in response to this and other comments to the Draft EIS. This additional text includes a summary of the performance of the existing reclaimed Dee Mine heap leach pads on the project site relevant to predicting net infiltration rates and water quality of the effluent. This additional text also summarizes the predicted flow rates using the Heap Leach Draindown Estimator (HLDE); and evaluates the proposed treatment of the residual heap leach effluent during the closure period. Additional information regarding the draindown modeling and performance and effluent water quality from the existing reclaimed Dee Mine heap leach facilities on the site was provided to BLM (BDMV

Letter F2 Continued

Leach Pad No. 11 is managed in a synthetically lined ET cell located on the northern perimeter of the facility.

Process solution management for the proposed Arturo Mine is discussed in the DEIS in Section 2.3.8.9 Post- Closure Monitoring and Maintenance. The DEIS contains inadequate information on the anticipated heap leach drain rate for Pad No. 12. The only reference provided is that of the observed draindown period for the last heap leach pad closed within the project area (Heap Leach Pad No. 11). This pad took 12 months to drain down, during which period draindown decreased from 300 to 2 gallons per minute (gpm). Based on this observed draindown, the time required to drain the proposed heap leach pad is estimated at approximately 2 years, with solution management/fluid inventory reduction activities planned for up to 30 years following this primary draindown (p. 2-43). EPA is concerned by the fact that the DEIS does not reference project-specific numerical simulation for the heap leach draindown rate, nor is there a discussion of the true representativeness of Heap Leach No.11 as an analog for the proposed Pad No. 12. Rehandling and weathering could considerably decrease grain size of the materials on Pads 1-9, 10, and 11, so their incorporation into Pad 12 could affect the overall transmissivity of the pad.
F2-11 Cont Given all of the above, as well as the substantial differences in overall dimensions, EPA does not believe that the figure provided represents an appropriate estimation of the heap leach draindown time or residual drainage rate for anticipating potential long term effects.

Furthermore, the DEIS briefly describes the draindown period observed for Pad 11 as 12 months (p. 2-43), but does not contain a detailed discussion related to reclamation and closure monitoring of draindown seepage, in particular, water quality information, from the reclaimed Dee Mine heap leach facilities. This information would be both valuable and significant in terms of evaluating the efficacy of previous reclamation efforts, and predicting draindown water chemistry with respect to heap leach development for the proposed action.

> **Recommendation:** Include a detailed discussion related to draindown of the reclaimed Dee Gold Mine heap leach facilities, with respect to water quantity and quality over time, in the Supplemental Draft EIS. Perform numerical modeling to more carefully estimate the probable length of the primary draindown period and predict the residual seepage rate. Include a more detailed discussion regarding seepage chemistry, rates and the representativeness of Pad No. 11 in comparison to Pad 12 to inform the reader of whether comparisons between these facilities are appropriate.

F2-12 The DEIS Section 3.4.2.1 describes potential impacts to surface water quality from the heap leach and other process facilities if process fluids, fuels, solvents, or other liquids were released to surface waters in sufficient quantities to exceed water quality standards or degrade beneficial uses; and if runoff, erosion, or sedimentation were accelerated to a degree that degraded surface water flows or features (p. 3.4-43). Although there is a clear potential for water quality impacts, the DEIS concludes that no impacts to surface water quality are anticipated from process components under proposed construction and operating conditions. This is attributed to the proposed project design and operation as a zero-discharge facility according to NDEP requirements. Compliance with interagency closure and reclamation requirements, including monitoring, is then stated as the primary means of minimizing the potential for long-term effects on surface water quality after cessation of proposed project operations (p.3.4-43).

Letter F2 Responses Continued

F2-11 Cont 2013). The comment regarding the detection of cyanide at site AR09 is addressed in the response to comment F2-3.

F2-12 BDMV submitted additional information to BLM during the Draft EIS review process regarding flow and water quality monitoring and data collected from the existing Dee Gold Mine (BDMV 2013). Additional text was added to the Draft EIS Section 3.4.2.1 in the water quality and geochemistry section in response to this and other comments to the Draft EIS. This additional text includes a summary of the performance of the existing reclaimed Dee Mine heap leach pads on the project site relevant to predicting net infiltration rates and water quality of the effluent. This additional text also summarizes the predicted flow rates using the Heap Leach Draindown Estimator (HLDE); and evaluates the proposed treatment of the residual heap leach effluent during the closure period. Additional information regarding the draindown modeling and performance and effluent water quality from the existing reclaimed Dee Mine heap leach facilities on the site was provided to BLM in response to this comment (BDMV 2013).

Letter F2 Continued

F2-12 Cont

The DEIS does not, however, provide any discussion on draindown water management and predicted water quality during reclamation and closure of the proposed the heap leach facility. As noted previously, the DEIS should include data showing the draindown water quantity and quality from the reclaimed Dee Mine heap leach facilities. This analog site information could then be used to inform predictions of draindown water quality at closure, and associated long-term reclamation, closure and monitoring requirements for the proposed heap leach facility.

Recommendation: Include a prediction of the heap leach facility draindown period and associated chemistry, based on the best available data and the use of the NDEP/BLM draindown model, in the Supplemental Draft EIS. These data can be used to inform long-term reclamation, closure and monitoring requirements to ensure protection of regional groundwater and surface water resources.

F2-13

Page 2-20 states that monitoring of the groundwater system near the proposed heap leach pad and processing facilities would be conducted using monitoring wells located downgradient and upgradient of the pad in compliance with the Water Pollution Control Permit. No specific information is provided regarding monitor well location, sampling frequency, mitigation triggers, or potential mitigation measures. While NDEP is the permitting agency responsible for the issuance of the Water Pollution Control Permit, the provisions of that permit are highly pertinent to the potential environmental impacts of the proposed project.

Recommendation: Include additional details regarding ground water quality monitoring, as outlined in the- Water Pollution Control Permit to be issued by NDEP, in the Supplemental Draft EIS. If this permit is still in draft form, note this and include the currently available draft information.

F2-14

Section 2.3.8.6 of the DEIS states that the design of Heap Pad 12 was, in part, informed by data from the existing heap leach pad closures at the site that have "demonstrated stability and acceptable draindown control since 2001" Based upon the data from previous heaps, BLM anticipates that the use of evaporation and ET cells will result in no discharge requiring treatment. However, "actual results would be monitored during the post-closure period and alternative use or treatment of the fluids would be developed if required." (p. 2-42). EPA acknowledges that predicting final closure and reclamation efficacy entails considerable uncertainty. NEPA allows for, and EPA encourages, the use of adaptive management to address circumstances where uncertainty remains regarding potential impacts. An AMP would allow for upfront contingency planning to be developed, while affording flexibility for unanticipated outcomes.

Recommendation: Include, in summary or incorporated by reference, an adaptive management plan for addressing uncertainties associated with the long term management of heap leach drain down in the Supplemental Draft EIS. Provide, in the adaptive management plan, as much information regarding specific action thresholds, range of contingency measures possible and estimated mitigation effectiveness possible given the best available data.

Pit Infiltration and Pit Lake

F2-15 According to the DEIS Section 3.4.2.1, permanent pit lakes are predicted to develop in the South, East,

Letter F2 Responses Continued

F2-13 See the Monitoring and Mitigation Plan in the Final EIS (Appendix B). BDMV submitted a site-wide monitoring plan for the proposed project to the BLM as part of the Plan of Operations (PoO). As described in Section 3.4.1.3 of the Draft EIS, mine dewatering for BGMI initiated in 1990 and continuing to the present has lowered groundwater elevations approximately 1,700 feet within a northwest trending zone that extends to near the center of the proposed project and includes the proposed site for the heap leach facility. Continued groundwater pumping for mine dewatering at the BGMI facility is projected to continue through 2021 to maintain the current drawdown until mining ceases. Numerical groundwater modeling predicts that full recovery of the groundwater levels will take several centuries after mine dewatering ceases. Because of the dewatered regional groundwater conditions (i.e., depth to groundwater), BDMV does not propose a groundwater monitoring plan for the heap leach facility. However, any groundwater monitoring required by the NDEP during the operation, closure, or post closure period would be implemented as required as part of the Water Pollution Control Permit.

No changes to the Draft EIS were made to address this comment.

F2-14 The conceptual plan for addressing heap leach draindown during the closure and post closure period was described in Section 2.3.8 in the Draft EIS. The final closure and reclamation plans for the heap leach facility are required to be submitted to the NDEP for approval at least 2 years prior to the anticipated closure date and would conform to all Water Pollution Control Permit regulations. Under the current regulatory environment it is anticipated that plans for closure and compliance monitoring would be adaptive in nature such that plans may be adjusted as necessary to address actual field conditions and meet the performance objectives. The Monitoring and Mitigation Plan in Appendix B of the Final EIS includes an adaptive management plan.

No changes have been made to the Draft EIS to respond to this comment.

F2-15 The carbonate aquifer is characterized as a marine carbonate rock with low primary permeability. However the permeability and storage in this aquifer is controlled by an interconnected network of fractures and dissolution features such that the aquifer behaves as a highly permeable equivalent porous media. An extensive groundwater monitoring network is in place across the region surrounding the existing mining projects located within the project vicinity. The groundwater monitoring data relevant to the mine site are presented in the Boulder Valley Monitoring Plan, quarterly monitoring reports (BGMI 2010).

Letter F2 Continued

and North Pits when inflow from the carbonate aquifer enters the pit areas. The pit lake water is predicted to have constituent concentrations that exceed the Nevada primary water quality standards for antimony and arsenic. The predicted concentrations of fluoride, manganese, sulfate, and TDS also exceed the Nevada secondary drinking water standards. These pit lakes are predicted to eventually behave as groundwater sinks. As a result, it is anticipated that in the long term (after approximately 200 years), these lakes would not affect the water quality of downgradient aquifers (p. 3.4-38).

F2-15 Cont

EPA is concerned that potential risk to downgradient aquifers during the period prior to, and during, pit lake filling may be underestimated in the DEIS. Although we acknowledge the additional modeling work performed to explore this issue (i.e. Schaefer 2011), the risk to downgradient aquifers could be greater than anticipated in the DEIS where fractured flow paths exist to allow pit lake groundwater to escape along preferential pathways. EPA is also concerned that the potential risk to wildlife posed by exposure to pit lake water may have been underestimated and no mitigation measures are included. If selenium, which bioaccumulates, or other contaminants that are toxic to wildlife were to increase only marginally beyond predicted levels, then exposure to wildlife could present at an unacceptable risk (p. 3.17-21). EPA is aware of examples of pit lake predictions that were miscalculated at other mines in Nevada.

Recommendation: Discuss the possibility of fractured flow and what risk this might represent to downstream aquifers prior to and during pit filling in the Supplemental Draft EIS. Potential mitigation measures should be outlined for implementation in the event that monitoring identifies contamination greater than is predicted by the models provided.

Stormwater

According to the DEIS Section 3.4.1.4 Rock Geochemistry, although potential impacts would be avoided or reduced under anticipated construction and operating conditions by compliance with agency programs and proposed measures, extreme weather events may create bypass conditions or unforeseen impacts. Severe (high intensity) storms, rapid snowmelt, or rain-on-snow events have the potential to damage operating or reclaimed project components. This has been known to occur at other mining sites in the region. Resulting adverse effects may include degradation of waters of the State and delays in successful restoration of post-mining land uses (p. 3.4-43).

F2-16

Nevada BLM has developed guidance on long-term mpnitoring and management (LTMM) closure costs to ensure the continuation of long-term treatment to achieve water quality standards and for other long-term post-mining maintenance requirements. This guidance recommends that LTMM costs be based on a 500 year period simulating perpetuity and include costs for dealing with acid rock drainage, groundwater contamination and miscellaneous access/site work including erosion controls.

Recommendation: The Supplemental DEIS should explain why storm water controls based on design for 100-year return interval storms are adequate for ensuring long term post-mining maintenance requirements for the Arturo Mine Project, and how this design is consistent with existing BLM guidance that the LTMM costs should be based on a 500 year period. Explain what is expected with respect to the functioning of the storm water channel and catchment features and maintenance requirements for both routine maintenance tasks and those associated with storm events exceeding design criteria. Over time, storm events would be expected to

Letter F2 Responses Continued

F2-15 Cont As described in Section 3.4 of the Draft EIS, groundwater monitoring has tracked the response of mine dewatering and water management activities on water levels in the regional carbonate aquifer system in the vicinity of the project since 1990. The results of this groundwater monitoring coupled with numerical groundwater modeling has demonstrated that the fractured rock carbonate aquifer system had responded to dewatering activities in a predictable manner such that the fractured rock can be modeled as an equivalent porous media. Therefore, the analysis provided in the Draft EIS and cited documents is based on the assumption that flow between the pits and the carbonate aquifer is occurring in a fractured rock medium where the flow occurs in highly interconnected fracture networks rather that isolated discrete fractures in evaluating the potential risk to the aquifer system. The potential risk to wildlife resources associated with water quality that may pond prior to pit lake development, and from the pit lake in later stages is addressed in Section 3.17 of the Draft EIS and described in detail in the ecological risk assessment developed for the pit lakes (Arcadis 2010).

No changes have been made to the Draft EIS to respond to this comment.

F2-16 The BLM Handbook 3809-1 and NDEP regulations were reviewed. The 500-year recurrence interval for storms is not used. Additional text has been added on page 3.4-8 to indicate the 100 year storm interval is aligned with current BLM policy.

Letter F2 Continued

F2-16 Cont compromise storm water run-on controls and run-off features. EPA recommends that BLM consider requiring that reclaimed features be designed with storm water controls based on a 500 year storm event, when such controls are important to ensuring the prevention of environmental degradation and/or the meeting of water quality standards, rather than only requiring funding for 500 years of maintenance of storm water control features designed for 100 year events.

Reclamation and Closure

F2-17 Cont The DEIS includes only general information in regards to the reclamation and closure planning for the proposed Arturo mine project. Numerous areas of analysis important to determining the project's environmental consequences are deferred to either the Final EIS (i.e. the site wide monitoring plan) or to various other points after the completion of the NEPA process or during the project life. Section 2.3.8 states that "The detailed closure plan for each facility would be prepared at least 2 years prior to the anticipated closure date and would conform with the Water pollution control permit regulations in effect at the time of closure." (p.2-36). Although EPA understands the necessity of the closure plan being *finalized* in at a time nearer to closure, the DEIS should contain sufficient information to assess the likely long term consequences of the project. EPA does not believe that this threshold has been met in this instance.

Section 2.3.8.2 states that post closure monitoring by NDEP could continue up to 30 years following completion of processing, based on current regulations. The duration of the post-closure monitoring would depend on the project's final closure plan and implementation.

Recommendation: Further discuss post closure water quality monitoring in the Supplemental DEIS, and consider the advisability of requiring at least 30 years of post-closure monitoring, with the option for a longer term requirement based upon the best available data at each point at which the monitoring plan is revised or updated. Describe the triggers and mitigating actions to be taken in the event that monitoring detects the release of contaminants from the site.

F2-18 Section 2.3.9.4 indicates that NDEP could require ongoing rock characterization studies to confirm the test results prepared in development of the EIS. EPA believes that ongoing rock characterization studies would be an important means of ensuring that pre-mine predictions were accurate and that the project will not have additional unforeseen impacts. Rock characterization during the active mining period would be a valuable component of ongoing site monitoring.

Recommendation: Include an adaptive management plan that outlines the monitoring, mitigation and adaptive considerations for detecting and controlling unforeseen impacts of the project in the closure and post-closure period in the Supplemental Draft EIS. Include, in the plan, the funding mechanism for the activities identified, in order to provide greater assurance that all future impacts and sources of contamination will be appropriately managed.

F2-19 Section 2.3.9.7 states that "BDMV submitted a site wide monitoring plan for the proposed project to the BLM as part of the PoO. The detailed water monitoring plan would be prepared prior to issuing the Final EIS and would be reviewed and updated annually to reflect changes in surface water and groundwater resources monitoring locations in the proposed project vicinity." (p. 2-49)

Letter F2 Responses Continued

F2-17 BLM has reviewed the information and finds that Chapter 2 provides sufficient detail on existing closure and post-closure obligations to analyze the proposed alternatives under NEPA. Existing data are referenced and available for detailed review. It is not practical to include all available data in the document. Section 2.3.8.2 clearly states that BLM's post-closure monitoring period is open-ended and could continue for more than 30 years, depending on site conditions at closure.

No changes have been made to the Draft EIS to respond to this comment.

F2-18 Section 2.3.8.9 Post-closure Monitoring and Maintenance describes how post-closure plans will be developed with NDEP through the Water Pollution Control Permit and requirements for the final closure plan submitted 2 years prior to closure. Section 2.3.3 Waste Rock Disposal Facilities references the BDMV waste rock management plan submitted as part of the PoO, which provides the basis for ongoing waste rock characterization. Data collected under the waste rock management plan along with data collected during standard mining procedures (blast hole data) will be used for final closure design. The Monitoring and Mitigation Plan in Appendix B of the Final EIS includes an adaptive management plan.

It is not the BLM's policy to include estimated costs of reclamation or post-closure maintenance in NEPA documents.

No changes have been made to the Draft EIS to respond to this comment.

F2-19 See the Monitoring and Mitigation Plan provide in Appendix B of the Final EIS. Section 2.3.9.7 describes the requirement for BDMV to develop a detailed water monitoring plan prior to issuing the Final EIS that would be updated annually to reflect changes in the surface water and groundwater resources monitoring locations in the proposed project vicinity. The current monitoring plan will be available to the public through BLM or NDEP.

No changes have been made to the Draft EIS to respond to this comment.

Letter F2 Continued

F2-19 Cont **Recommendation:** Summarize the site-wide monitoring plan in the Supplemental Draft EIS and include the complete plan as an appendix to the Supplemental Draft EIS. Discuss the timing and duration of monitoring and how monitoring would be funded in the long term.

Financial Assurance

The availability of adequate resources to ensure effective reclamation, closure, and post-closure management is a critical factor in determining the significance of the project's potential impacts and its environmental acceptability. Based upon the potential that Heap Leach Pad No. 12, the proposed waste rock facilities and the existing on site facilities will need long term management, EPA believes that a long term funding mechanism will need to be established for the Arturo mine project.

F2-20 **Recommendation:** Disclose in the Supplemental EIS an estimate of funding for the reclamation and the closure bond, as well as for the long-term funding mechanism for the proposed Arturo Mine project; analyze the adequacy of the funding amount and mechanism, including associated uncertainties, to ensure that sufficient funds would be available as long as they are needed; and prepare more detailed monitoring and mitigation plans with established contingencies in the event that the project proponent is no longer financially capable of implementing essential mitigation measures in the post-closure period.

Page 3.4-56, Monitoring Measure SW-1 states that, "sediment and other water quality constituents could collect in existing impoundments within the proposed project area or within proposed storm water catchments created during project operation, closure, or reclamation. The functions of the impoundments could be impaired due to loss of storage capacities." Mitigation Measure SW-1, identified to mitigate this potential risk, indicates that, should the function of impoundments on the project site be impaired by sediment and other constituents, action would be taken to either remove sediment from the impoundment or construct new impoundments. It is not clear, from the discussion provided, whether this monitoring and mitigation would be mandated for the post-closure period of the
F2-21 project as well as during project operation and reclamation. The DEIS suggests that some amount of ongoing seepage would occur in the post-closure period. This seepage would require impoundment and management in the long term, thereby necessitating monitoring and mitigation of the sort described under SW-1 in the long term post-closure period.

Recommendation: Describe in the Supplemental Draft EIS the period during which Monitoring and Mitigation measure SW-1 would be implemented. If this measure is not already intended to apply post-closure, state that these activities will be mandated in the long term post-closure period for the proposed project. Describe, in detail, how these activities would be funded in the long term, as previously discussed.

Geochemistry

According to the Draft EIS Section 3.4.1.4 Rock Geochemistry, kinetic testing, consisting of humidity cell testing was conducted for 52 weeks on six samples. Two of the six samples became strongly acidic
F2-22 over the period of testing. Acid generation was accompanied by high concentrations of trace metals. The samples that did not become acidic showed low concentrations of trace metals (p. 3.4-20). EPA appreciates the fact that SRK and Schafer conducted the kinetic cell tests for 52 weeksrather than only the minimum of20 weeks sometimes employed. However, no citation is provided for the geochemical

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Letter F2 Responses Continued

F2-20 Section 2.3.8 describes how the final closure plan will be developed in accordance with BLM and NDEP regulations. The final closure plan includes post-closure monitoring and maintenance. It is not BLM's policy to include estimated costs of reclamation or long-term maintenance in NEPA documents. Information on the reclamation cost estimate and/or financial guarantee amount, while public information is not included in the environmental analysis nor is public comment on funding closure requested. In accordance with 43 CFR 3809.401 (d), the BLM requests a reclamation cost estimate only after processing and modification of the proposed PoO is complete.

No changes have been made to the Draft EIS to respond to this comment.

F2-21 Monitoring and Mitigation measure SW-1 is focused on monitoring existing and proposed facilities to identify trends to modify erosion control, improve reclamation plans and/or trigger mitigation. Section 2.3.8 describes how the final closure plan will be developed in accordance with BLM and NDEP regulations. The final closure plan includes post-closure monitoring and maintenance. It is not BLM's policy to include estimated costs of reclamation or long-term maintenance in NEPA documents. Information on the reclamation cost estimate and/or financial guarantee amount, while public information is not included in the environmental analysis nor is public comment on funding closure requested. In accordance with 43 CFR 3809.401 (d), the BLM requests a reclamation cost estimate only after processing and modification of the proposed PoO is complete.

No changes have been made to the Draft EIS to respond to this comment.

F2-22 The text of the Draft EIS was revised to add citations for the kinetic test results and a summary table providing the key results from the test was included. Additional details regarding the kinetic tests are provided in the updated Waste Rock Management Plan (Schafer 2013) submitted to the BLM after publication of the Draft EIS.

Letter F2 Continued

F2-22 Cont

technical report from which the kinetic test results portion of this section of the DEIS was compiled. Without additional information, EPA cannot determine what static samples were used for kinetic testing, what formations were te'sted, why the static test samples were selected, how many samples that were between 1 and 3 Net Neutralizing Potential were tested, or other important information for determining the suitability of the kinetic testing program. Based upon the data presented, it is also unclear what static testing (acid base accounting) cutoff was then used to determine the percentage of potentially acid generating material. No information is provided regarding why the relatively small number of samples tested (compared to other mine sites) is appropriately representative of the new material to be mined..

Recommendation: Include additional information in the Supplemental Draft EIS on the kinetic tests performed (including an appropriate citation). The discussion should include what formations underwent kinetic testing, how samples were selected, the NNP of all samples tested, the protocol that was used to determine when the tests were discontinued, and how the tests were analyzed. Present the results in greater detail to support the conclusions reached in the DEIS. In addition, provide the rationale for choosing the limited number of samples involved in the geochemical program.

Offsite Ore Processing

F2-23

Section 2.3.4.6 states that, based on metallurgical and economic considerations, an average of 1.8 MT per year (4.5 MT per year maximum) mill-grade ore from the proposed open pit would be sold to BGMI for further processing. Transportation of the mill-grade ore would be on the Bootstrap Haul Road (Section 2.3.5.2, Bootstrap Haul Road). Ore from the proposed project would be processed under existing BGMI permits and no expansion ofBGMI facilities would be necessary.

The DEIS does not account for the connected or cumulative impacts associated with processing an estimated 14 MT (DEIS page 3.3-12) of mill-grade ore from the proposed Arturo Mine at the BGMI facilities. Tailings deposition will decrease the estimated life of facilities permitted to manage BGMI ore production and beneficiation. Although additional permitting is not immediately planned for the BGMI facilities to accommodate this action, it is unclear to what extent the addition of tailings and processing waste materials from the Arturo Mine may contribute to a possible future need for a request for expansion of BGMI facilities. Should such future expansion occur, the impacts of expansion would, in part, be due to the processing of Arturo ore and, thus, be secondary impacts of the Arturo Mine. It is also unclear if the additional processing of Arturo Mine mill-grade ore at the BGMI facilities has the potential to contribute to possible contaminant leaching potential from the BGMI facilities.

Recommendation: Include the impacts associated with the 14 million tons of tailings disposal that the Arturo Mine would contribute to the BGMI facility in the cumulative impacts discussion in the Supplemental Draft EIS. Discuss the potential for future expansion ofthe BGMI facility and the extent to which Arturo Mine processing could contribute to the need for expansion.

F2-24

Page 2-20 states that, "Oxide and non-oxide ores would be stockpiled separately in the stockpile areas, the ground surface below a stockpile for non-oxide ore would be lined to prevent seepage into the ground." There is not enough information regarding ore stockpile to reasonably assess whether this action poses a risk to surface or groundwater quality. It is unclear what type ofliner will be employed for underlying the ore stockpile. We cannot determine what the potential seepage chemistry of ore

Letter F2 Responses Continued

F2-23 The impact of processing Arturo ore at the BGMI facility was reviewed in preparation of the PoO. As stated in Section 2.3.4.6 Barrick Goldstrike Mines Inc. Ore Processing, "Ore from the proposed project would be processed under existing BGMI permits and no expansion of BGMI facilities would be necessary."

Text has been added to this section in Table 2-1 of the Final EIS to indicate the relatively small contribution Arturo would make to the BGMI permitted tailings capacity.

F2-24 Additional text was added to Section 3.4.2.1 under the minor heading "Ore Stockpiles" in response to this comment.

Letter F2 Continued

effluent might be should such seepage appear.

F2-24 Cont

Recommendation: Include in the Supplemental DEIS additional details regarding the stockpiling of ore at the Arturo Mine site, including the type of liner planned for use. Provide further discussion to identify the potential adverse environmental impacts that could result from ore stockpiling, including the expected seepage chemistry, should seepage through the ore stockpile be realized.

Partial Pit Backfill Alternative

F2-25

Section 2.4.2 of the DEIS states that, because of the physical configuration of the three-lobed ore body at the proposed project site, mining operations could be sequenced to allow for backfilling of the South and East Arturo pits. Partial backfilling provides the potential environmental benefits of reducing the total acreage of post closure disturbance and reducing the eventual pit lake volume once groundwater levels rebound. Page 2-61 states that, despite the placement of approximately 247 million tons of waste rock material in the pits, rather than on the West WRDF, the overall footprint ofthe West WRDF would remain the same as under the proposed action alternative. "Keeping the West WRDF footprint the same as that for the Proposed Action allows for the decrease in height, which allows for more efficient haul truck fuel usage on the West WRDF construction." The efficiency of haul truck fuel usage is the only rationale that EPA was able to identify for this WRDF configuration. It is unclear whether consideration was given to a partial backfill alternative that includes the construction of the West WRDF with height and slope dimensions similar to those under the Proposed Action and a reduced footprint. It seems that doing so would significantly reduce the total disturbance area under this alternative, thus reducing impacts on vegetation, wildlife, special status species, and other potential impacts. In light of our concerns regarding impacts to Antelope Creek from fill of tributaries, it may be possible, with a smaller-taller West WRDF design, to avoid fill to the Antelope Creek watershed completely.

Page 3.4-46 states that, in regards to the Partial Pit Backfill Alternative, the overall quantity of groundwater recharge from the pits during the period prior to and during pit lake filling would be substantially less than would occur under the Proposed Action. Given the concerns previously expressed regarding pit water infiltration, this potential reduction could represent a significant reduction in the risk of contamination the mine represents.

Recommendation: Include in the Supplemental Draft EIS an alternative, or modification of the Partial Backfill Alternative, that considers the placement of waste rock in the West WRDF in a smaller, taller footprint, and consider the potential environmental consequences of this change in design. If this alternative would become economically infeasible in the absence of an ability to haul waste rock more efficiently to the West WRDF, clearly describe why that is the case.

F2-26

Although the Partial Pit Backfill Alternative appears to represent a possible reduction in environmental impacts as compared to the Proposed Project, EPA notes that page 3.4-45 states that, "Although geomorphic drainage designs and storm water controls would be implemented, the potential for erosion, sedimentation and related run off impacts to upper Boulder Creek would increase under the Partial Pit Backfill Alternative in comparison to the Proposed Action." Based upon the information presented, it is unclear how significant this increase in potential impacts would be and whether this risk could be overcome through appropriate engineering design and mitigation.

Letter F2 Responses Continued

F2-25 A change in Draft EIS text has been made on page 2-61, 3rd paragraph: "...Keeping the West WRDF footprint the same as that for the Proposed Action and decreasing the waste rock capacity under this alternative allows for a lower final slope angle for the facility. While smaller footprint configurations could have been analyzed for the Partial Pit Backfill Alternative, using the same footprint as the Proposed Action was chosen for analysis in order to include potential benefits from the lower angle slope in the analysis such as visual blending with surrounding topography, decreased surface erosion, and more efficient haul truck fuel usage during construction. As summarized in Table 2-12, the Proposed Action West WRDF footprint had previously been redesigned to minimize impact to the mule deer migration corridor. Table 2-16 provides...".

For the discussion on pages 3.4-45 and 3.4-46 of the Draft EIS (noted in introduction to comment), no changes to the Draft EIS were required.

F2-26 While other configurations of the Partial Pit Backfill Alternative could have been analyzed, the alternative design presented in the Draft EIS for the East WRDF, West WRDF and the in pit backfill area was reviewed and determined to present a reasonable compromise between hauling efficiency, stability, erosion prevention, and ultimately blending with natural topography. The response to comment F2-25 provides additional information on criteria used to develop and analyze this alternative.

No changes have been made to the Draft EIS to respond to this comment.

Letter F2

F2-26 Cont

Recommendation: Further examine the balance between the reductions and potential increases in environmental impacts and risks posed by the Partial Pit Bc:tckfill Alternative in the Supplemental Draft EIS. Discuss what criteria the BLM used to determine the preferred alternative and in what ways the Partial Pit Backfill Alternative does or does not meet those criteria.

Waters of the United States and Clean Water Act Compliance

F2-27

Based_on our review of information provided by JBR Environmental Consultants Inc. and the US Army Corps of Engineers (Corps)_in support of the jurisdictional determination for Boulder Creek, EPA does not concur with the August 13, 2010 final determination that Boulder Creek is hydrologically isolated from the Humboldt River and the nearest Traditional Navigable Water, and is, therefore, not a water of the United States subject to CWA jurisdiction. We have communicated these concerns to the Corps both before and following the Corps' August 2010 determination. In accordance with Corps policy, its jurisdictional determination for Boulder Creek will be subject to reconsideration in August of2015. However, regardless of Boulder Creek's current jurisdictional'status, to the extent that pollutants related to the proposed project may move via Boulder Creek to the Humboldt River, the applicant would need to ensure compliance with applicable sections of the Clean Water Act, including Section 402.

Recommendation: The Supplemental DEIS should discuss how the project proponent would ensure compliance with the Clean Water Act should Boulder Creek be reclassified as a Water of the United States in 2015 or should pollutants related to the proposed mining project move via Boulder Creek to the Humboldt River.

F2-28

The section entitled "Drainage Area Considerations" on page 3.4-26 ofthe DEIS identifies potential project impacts to drainages within the Antelope Creek watershed. Portions of Antelope Creek and its tributaries have been determined by the Corps to be waters of the United States under the Clean Water Act; however, EPA was unable to determine whether the applicant has conducted a jurisdictional waters review for waters/wetlands within the Antelope Creek watershed potentially impacted by the proposed project.

Recommendation: Provide documentation of the jurisdictional status of waters in the Antelope Creek watershed potentially impacted by the proposed project in the Supplemental Draft EIS.

F2-29

The DEIS states that "Runoff and seepage from the West WRDF would contribute to flow in small ephemeral tributaries of Antelope Creek (p. 3.4-52)". The discharge of any seepage into a water of the United States would require an individual National Pollutant Discharge Elimination System (NPDES) permit from NDEP. NDEP's Mining Stormwater General Permit (NVR300000) authorizes the discharge of stormwater from the mine site, but does not authorize the release of non-stormwater flows such as mine seeps or mine process water. Therefore, discharge of seepage from the West WRDF is prohibited except as allowed under an individual NPDES permit.

Recommendation: Describe in the Supplemental Draft EIS how an individual NPDES permit will be obtained for this non-stormwater discharge, or the measures that will be imposed to

Letter F2 Responses

F2-27 Draft EIS Section 1.7 Projects, Permits, and Approvals lists the required permits or approvals required for the project including Clean Water Act programs. The section on Waters of the United States on page 3.4-8 describes evaluation of jurisdictional water status and the U.S. Army Corps of Engineers conclusion in August 2010.

No changes have been made to the Draft EIS to respond to this comment.

F2-28 Text has been changed to expand the discussion of jurisdictional waters under Section 404 of the Clean Water Act to include Antelope Creek in Draft EIS Section 3.4.1.2, Surface Water Resources.

F2-29 Text has been changed in Draft EIS Section 3.4.2.1, Proposed Action, in response to comment. Seepage is not anticipated from the West WRDF due to the reclamation practices described and analyzed elsewhere in the EIS. The comment is speculative with respect to seepage; the need for an individual permit to address any seepage would be addressed through NDEP, Bureau of Water Pollution Control, which reviews the project-specific Water Pollution Control Permit application and related inspection results. Stormwater discharges would be managed through the Nevada State General Stormwater Permit or Water Pollution Control Permit in accordance with Nevada regulatory policy, permit reviews, and provisions

Letter F2 Continued

F2-29 Cont ensure that non-stormwater discharges from the project are prevented from release into any water of the United States.

Air Quality

National Ambient Air Quality Standards

On page 3.8-13, the DEIS states that the air quality impacts of the Proposed Action were modeled, including the addition of background concentrations, to determine that all criteria pollutant concentrations would be in compliance with the applicable ambient standards at any modeled point of public access. The air quality modeling performed to reach this conclusion used the Plan of Operation Area as the model boundary and did not include those emissions associated with the transport of mill-grade ore along Bootstrap haul road to the Barrick Goldstrike facility, or the emissions generated at the Goldstrike mine. Page 2-27 of the DEIS states, "Truck traffic would be present for up to 24 hours per day, 365 days per year. Up to 78 one-way trips per day would occur on the Bootstrap Haul Road." Table 3.8-6 then provides the maximum potential annual emissions resulting from the ore haulage to the BGMI facility. The emissions totals (provided in tons per year) exceed the annual emissions indicated in Table 3.8-4 for activities within the POO boundary by four times or more for all of the pollutants disclosed. Based on these data, it is unclear whether the modeling performed for the project might show exceedance ofNational Ambient Air Quality Standards for PM2.s, PM10, SOx, CO and NOx if the actions along Bootstrap haul road were included in the air modeling. This does not mean that EPA believes that the Proposed Action would necessarily violate a NAAQS, but EPA is unable to determine whether or not the project would result in significant adverse environmental impacts for which additional mitigation measures should be considered.

F2-30 We recognize that some of the emissions sources associated with the Proposed Action would be covered by a permit issued by the Nevada Department of Environmental Protection, Bureau of Air Pollution Control, and others, such as the combustion emissions from mobile equipment, would not be covered. We also recognize that the permit would be issued under a program approved by EPA as meeting the requirements of Title I of the federal Clean Air Act, and that nearly all ofthe mobile sources are, to some degree, subject to emissions standards established by EPA under regulations promulgated under Title II of the FCAA. However, source-specific emissions standards are fundamentally different than health-based ambient air quality standards. Additionally, haulage along the Bootstrap haul road may or may not be classified as mobile source emissions, depending on the freedom of access of the public to this corridor and other factors. Regardless, for NEPA purposes, ambient air quality impact analyses should not distinguish between Title I sources and Title II sources, nor should such analyses discount emissions sources because they do not fall within the POO boundary. Instead, the impact analyses should take into account all Project-related emissions sources (fugitive and non-fugitive stationary, area, and mobile) and evaluate whether such sources, considered together, would cause or contribute to an exceedance of the NAAQS.

Section 3.8.4 states that no additional monitoring or mitigation measures have been identified beyond those that NDEP might require as a part ofthe air quality permitting process. No mention is made, however, as to the status of a possible NDEP Air Permit, nor is there any discussion of probable mitigation measures that would be imposed by such a permit. This section then concludes that no significant impacts to air quality would be anticipated as a result of the Proposed Action. It is not clearly

Letter F2 Responses Continued

F2-30 Updated modeling results have been included. Tables 3.8-5 and 3.8-6 have been revised.

Letter F2 Continued

demonstrated that the information provided truly supports the conclusion drawn regarding the potential for significant impacts to air quality.

F2-30 Cont

Recommendation: Demonstrate in the Supplemental Draft EIS that the project as a whole, including all proposed activities, would not result in exceedance ofNational Ambient Air Quality Standards. Should modeling indicate a potential exceedance, discuss the potential impact upon sensitive receptors and the regional criteria pollutant attainment status. Discuss feasible mitigation measures for reducing these impacts, and indicate whether such mitigation would be required as a component of an NDEP air permit, or whether the BLM might require this mitigation as a condition of its POO permit approval.

Additional Mitigation

Although the area where the Proposed Project will be implemented is in "attainment-unclassifiable" for all pollutants having an air quality standard, in the interest of minimizing adverse impacts, EPA recommends consideration of measures to reduce emissions of criteria air pollutants and hazardous air pollutants. Some examples of measures that could be implemented are provided below.

F2-31 Cont

Recommendations:

- *Equipment Emissions Mitigation Plan (EEMP)* -The Supplemental DEIS should identify the need for an EEMP. An EEMP will identify actions to reduce diesel particulate, CO, hydrocarbons, and NOx associated with construction activities. We recommend that the EEMP require that all construction-related engines:
  - o are tuned to the engine manufacturer's specification in accordance with an appropriate time frame;
  - o do not idle for more than five minutes (unless, in the case of certain drilling engines, it is necessary for the operating scope);
  - o include particulate traps, oxidation catalysts and other suitable control devices on all construction equipment used at the Project site;
  - o use diesel fuel having a sulfur content of 15 parts per million or less, or other suitable alternative diesel fuel, unless such fuel cannot be reasonably procured in the market area; and
  - o include control devices to reduce air emissions. The determination of which equipment is suitable for control devices should be made by an independent Licensed Mechanical Engineer. Equipment suitable for control devices may include drilling equipment, generators, compressors, graders, bulldozers, and dump trucks.

Wildlife and Aquatic Biological Resources, Wetlands, and Special Status Species

F2-32

Section 3.14 of the DEIS states that the proposed project has the potential to affect 12.6 acres of riparian and wetland vegetation, including direct disturbance of 1.6 acres of wetland. The mitigation proposed for this impact involves the fencing of a 34 acre plot in the Water Canyon spring complex (p. 3.14-18). No information is provided, however, describing the current status of these 34 acres, e.g., the acres of wetlands contained therein, the general function and health of these wetlands, or the likelihood that implementation would have an appreciable impact on these characteristics. Furthermore, it is not clear

15

Letter F2 Responses Continued

F2-31 The project will maintain compliance with the required air quality permit program. A preventative maintenance program for vehicles will be implemented. A Class II Air Permit has been issued by NDEP.

No changes to the Draft EIS text have been made in response to this comment.

F2-32 Mitigation Measure W-1 was revised in response to this comment. See the Monitoring and Mitigation Plan in Appendix B of the Final EIS.

Letter F2 Continued

F2-32 Cont whether any direct replacement of wetland acres will occur for the 1.6 acres of riparian zones/wetland features that the project would directly remove. While Section, Township and Range are identified textually, no map is provided identifying the mitigation plot in relation to the project area. Finally, while the exclusion of livestock from these lands may serve to reduce trampling and grazing within the plot, fencing would likely have the secondary effect of deterring wildlife access and utilization as well.

Recommendation: Provide a figure in the Supplemental Draft EIS identifying the location(s) of proposed mitigation; describe the site characteristics, including acres of wetlands, health and function; and provide a discussion of secondary wildlife impacts that may result from the fencing off of the mitigation area.

F2-33 A total of 46 special status species were identified as potentially occurring within the Special Status Species study area, including species listed as threatened and endangered under Section 7 of the Endangered Species Act. As stated in the DEIS, the BLM, in coordination with the United States Fish and Wildlife Service, must ensure that any action that it authorizes, funds, or carries out would not adversely affect a federally listed threatened or endangered species. Despite this acknowledgement of the need for consultation with the USFWS, Section 3.18-Special Status Species does not contain further discussion of the current state of consultation with the USFWS regarding the Arturo Project.

Recommendation: Describe in the Supplemental Draft EIS the status of consultation activities with the USFWS in regards to impacts to ESA listed species, including the timing and/or findings of the Biological Assessment and the Biological Opinion from the Fish and Wildlife Service. Provide in the Final EIS, if not the Supplemental DEIS, a summary of the Biological Opinion and any additional mitigation measures required.

Other Water Resource Comments

F2-34 The DEIS did not include a map identifying the hydrologic study area for direct and indirect impacts to water resources as described on page 3.4-1. The textual description is insufficient and the visual cues provided in reference to figure 3.4-2 only provide north/south bounds for the study area, and do not indicate the overall area considered. The DEIS does not address whether potential impacts to Antelope Creek were included in the direct/indirect study area or whether impacts to Antelope Creek were only examined in the cumulative context.

Recommendation: Include a figure in the Supplemental Draft EIS showing the direct and indirect hydrologic study area for water resources. In light of the possibility that the project will affect Antelope Creek, include Antelope Creek in the study area.

F2-35 Based on location, description and water quality data provided, it seems highly likely that a number of the seeps identified in Figure 3.4-2 are fed by infiltration through and under existing mine facilities, however this figure does not contain an overlay of existing facilities on the project site, so making this determination based on the information contained in the DEIS, alone, is difficult.

Recommendation: Revise Figure 3.4-2 or include a new figure in the Supplemental DEIS that clearly displays the existing Dee facilities overlain on the seep location information. Those seeps that appear to be mine water discharge should be clearly labeled as such.

Letter F2 Responses Continued

F2-33 The USFWS provided comments on the Draft EIS in a letter dated February 28, 2013.

No changes have been made to the Draft EIS in response to this comment.

F2-34 Figure 3.4-1 has been revised to show the indirect/direct study area and the CESA. Monitoring stations associated with the study area and Antelope Creek have been added to Figures 3.4-2, 3.4-5, and 3.4-6 in response to this comment. The description of the study area on page 3.4-1 has been revised to include the Rock Creek Valley/Antelope Creek study area.

F2-35 Figure 3.4-2 has been revised in response to this comment to show the existing facilities and indicate which features are possibly affected by existing mine drainage.

Letter F2 Continued

F2-36 Figures 3.4-3, 3.4-4 and 3.4-5 label Boulder Creek as perennial in the reach nearest to the project site. The map key for these figures indicates that the stream segments highlighted in blue are "perennial stream reach(s)". While Boulder Creek is labeled intermittent/ephemeral downstream ofthe project, the reach adjacent to the POO boundary is blue in all three of the figures cited. This is in conflict with the text of the DEIS, which describes Boulder Creek as intermittent adjacent to the POO boundary.

Recommendation: Please clarify this discrepancy.

Letter F2 Responses Continued

F2-36 Figures 3.4-3, 3.4-4, and 3.4-5 have been changed to more clearly show the stream reaches in the area that are intermittent or ephemeral. Flow durations on upper Boulder Creek have been revised from older assessments made in the 1990s using black and white aerial photos from that period. Current evaluations use gaging data along Boulder Creek and inspection of color aerial images from recent years.

Letter S1

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
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Governor

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Deputy Director

February 28, 2013

John Daniel
Project Manager- Arturo Mine Project
Tuscarora Field Office
3900 Idaho Street
Elko, NV 89801

RE: Arturo Mine Project DEIS

Dear Mr. Daniel,

S1-1 Thank you for the opportunity to review and provide comments on the Arturo Mine Project. The Nevada Department of Wildlife (NDOW) is concerned with impacts to fish and wildlife resources and their associated habitats within the proposed area.

S1-2 Mule deer currently migrate through the Dee Gold Mine area to and from their winter range on the Dunphy Hills and Boulder Valley. In agreement with BLM, NDOW would recommend that the proposed action would be chosen to maintain and facilitate a mule deer migration corridor north of the Waste Rock Disposal Area.

S1-3 NDOW would request the opportunity to be a part of the mitigation process throughout the life of the project. Maintaining a cooperative working relationship between BLM and NDOW could promote mitigation success.

Should you require additional information or clarification on the above information, please contact me.

Sincerely,

Lindsey Lesmeister
Eastern Region Mining Biologist
Nevada Department of Wildlife
60 Youth Center Road
Elko, NV 89801
775-777-2368
llesmeister@ndow.org

Letter S1 Responses

S1-1 Comment noted.

S1-2 Comment noted.

S1-3 Comment noted.

Letter S1 Continued

	EIS Section	Commenter ID	
S1-4	ES-7	NDOW	Five pit reservoirs- How is the construction of pit reservoirs considered mitigation? Water quality of pit reservoirs are questionable, therefore could become more of a wildlife hazard'
S1-5	2.3.6.3	NDOW	This section states transmission lines inside and outside PoO will be constructed with double wooden poles. Given what has been recommended for the Newmont Midas Mine expansion and Ormat Tuscarora geothermal facility, the proponent should look at burying lines or use a single pole design that limits corvid and raptor perching.
S1-6	2.3.6.8	NDOW	Section describes a 4- strand fence with 3- barb strands and a smooth bottom strand will be used to fence off the PoO. NDOW and BLM need to recommend the use of 3- strand fence with 2- barb strands and a smooth bottom strand per the specifications found in the Area 6 Mule Deer Working Group Habitat Management Practices document- Habitat Management Practice I: Wildlife-Friendly Fencing Specifications, page 16. Bottom to top spacing should be 18", 1 0" and 12".
S1-7	2.3.9.9	NDOW	Need to use 3 strand fence referenced in the Area 6 Mule Deer Working Group Habitat Management Practices document- Habitat Management Practice I: Wildlife-Friendly Fencing Specifications, page 16. Bottom to top spacing should be 18", 10" and 12".
S1-8	2.3.9.10	NDOW	Cattle Movement and Access to Water. Water will be supplied during cattle drives. The section does not specify the duration water will be supplied for. Recommend only providing water during the 3-4 days needed for spring and fall gathers. Shut water off for the remainder of the year as to not attract cattle to the area.
S1-9	3.16.2.1	NDOW	Proposed action, last paragraph states two range improvements are located within the vicinity of the study area. A cattle guard to restrict pronghorn access. Why is a cattle guard being used to restrict pronghorn access?
S1-10	3.17.1.2	NDOW	First paragraph on page 3.17-2 inaccurately portrays the Area 6 mule deer herd. The first two sentences should be changed to: The Area 6 mule deer population has shown a general decline over the past 30 years. Due to a reduction in winter habitat quality, primarily resulting from wildfires and habitat fragmentation. The second to last sentence should be changed to: However, improved habitat conditions due to mild winters, increased precipitation and hundreds of thousands of dollars of habitat restoration have resulted in an increase of mule deer numbers over the last three years.
S1-11	3.17-29	NDOW	Mitigation Measure WL-1. What kind of liners will be used to line the bottom of the reservoirs? The section does not discuss wildlife egress. Plastic lining at the bottom of the reservoir is a wildlife hazard and drowning potential. Wildlife protection methods should be taken for this lined pond, either escapement ramps to facilitate wildlife escapement or fencing to proclude wildlife.
S1-12	3.17.4	NDOW	Mitigation Measure WL-2. No mention of maximum monetary contribution for restoration activities. Who will oversee the restoration/ chosen technique(s)? Will there be a wildlife working group developed to oversee implementation of the proposed mitigation.
S1-13	3.18.4	NDOW	Mitigation Measure SS-1. No mention of maximum monetary contribution for restoration activities. Who will oversee the restoration/ chosen technique(s)? Will there be a wildlife working group developed to oversee implementation of the proposed mitigation.

Letter S1 Responses Continued

S1-4 See the Monitoring and Mitigation Plan in Appendix B of the Final EIS.

No changes to the text of the Draft EIS were made in response to this comment.

S1-5 Text has been changed on page 2-30, Section 2.3.6.3, Electrical Power, to indicate single wooden poles will be used where possible. A double pole configuration would be used to support the powerline span running across the existing reclaimed TD2. The double pole configuration would allow the poles to be placed further apart, safely supporting the longer transmission line span without disturbing existing reclaimed TD2.

S1-6 BLM reviewed the comment and determined 4-strand barb wire would be preferential. Grazing pressure is too great in the area for 3-strand barb wire. Additionally calves can crawl under 3 strand fences.

No changes to the text of the Draft EIS were made in response to this comment.

S1-7 BLM reviewed the comment and determined 4-strand barb wire would be preferential. Grazing pressure is too great in the area for 3-strand barb wire. Additionally calves can crawl under 3 strand fences.

No changes to the text of the Draft EIS were made in response to this comment.

S1-8 See the Monitoring and Mitigation Plan in Appendix B of the Final EIS.

No changes to the text of the Draft EIS were made in response to this comment.

S1-9 Text revised to state …"a cattleguard and a water well that is not currently flowing." The reference to restricting pronghorn access was an errorr.

S1-10 Subsequent discussions between BLM and NDOW resulted in revising the text to : "...a general decline over the last 30 years due to …"

S1-11 Text revised to state that the reservoirs will remain unlined.

S1-12 See the Monitoring and Mitigation Plan in the Final EIS (Appendix B).

No changes to the text of the Draft EIS were made in response to this comment.

S1-13 See the Monitoring and Mitigation Plan in the Final EIS (Appendix B).

No changes to the text of the Draft EIS were made in response to this comment.

Letter S1 Continued

S1-14	3.18.9	NDOW	Pygmy Rabbit. Suitable sagebrush habitat occurs within the project area and pygmy rabbits have a high potential to be present. If burrows are found efforts to establish the usage of the burrow should be determined. Destruction of active burrows should be avoided and NDOW should be consulted.
S1-15	3.18.10	NDOW	Special Status Species. No golden eagle nest were found but an individual was observed in the project region. The project area contains suitable foraging habitat for golden eagles, and this suitable habitat will be lost with the construction of the mine. Furthermore several other raptor species have the potential to use the project area for suitable foraging habitat.
S1-16	3.18.14	NDOW	Western burrowing owl. Based on the presence of suitable nesting and foraging habitat within the study area, the potential for owls is high. If burrows are found efforts to establish the usage of the burrow should be determined. Destruction of active burrows should be avoided and NDOW should be consulted.
S1-17			Five pit reservoirs- How is the construction of pit reservoirs considered mitigation? Water quality of pit reservoirs are questionable, therefore could become more of a wildlife hazard'

Letter S1 Responses Continued

S1-14 A baseline survey was completed and no pygmy rabbits were found.

No changes to the text of the Draft EIS were made in response to this comment.

S1-15 A baseline survey was completed and no golden eagle nests were found. Applicant-committed measures in Section 2.3.9.9 Wildlife, Special Status and Livestock Protection include protection for raptors.

No changes to the text of the Draft EIS were made in response to this comment.

S1-16 A baseline survey was completed and no burrowing owls were found.

No changes to the text of the Draft EIS were made in response to this comment.

S1-17 See response to Comment S1-4.

Letter N1 Continued

Great Basin Resource Watch

Working with Communities to Protect Their Land Air and Water

236 Keystone Ave. Reno, NV 89503
775-348-1986, www.gbrw.org

February 25, 2013

Attention: John Daniel
Arturo Mine Project, Project Manager
Bureau of Land Management
3900 Idaho Street
Elko, NV 89801

re: *Draft Environmental Impact Statement (DEIS) for Barrick-Dee Mining Venture Inc.'s (BDMV) proposed Arturo Mine Project*

Dear Mr. Daniel,

Great Basin Resource Watch (GBRW) appreciates the opportunity to comment on this very significant project. The following comments are based solely upon the DEIS and focused on water quality and pit lake formation.

<u>Full Backfill Alternative Should be Considered</u>

Under the partial backfill alternative only one pit lake forms, which is expected to have roughly similar
water quality as that of the proposed action. However, there is no discussion of the impact to
N1-1 groundwater due to likely flow-through of the East and South pits. Presumably this does occur and
could impact groundwater. BLM needs to clarify if flow through is expected, and analyze potential
impacts to groundwater.

Given the analysis in the DEIS one would assume that there is no adverse effect from the potential
flow-through of the East and South pits. If this is true, then BLM should also consider a complete
backfill, so that no pit lakes form. Would this alternative result is fewer adverse impacts to water
N1-2 quality? Often this option can produce flow-through which can then degrade groundwater, but the text
in the DEIS leads GBRW to think this is not the case here and thus complete backfill of pits should not
be eliminated from consideration.

<u>Potential to Degrade Waters of the State</u>

In the first 50 to 150 years poor quality water is expected to infiltrate in the aquifer. The DEIS states: *"Water that accumulates in the pits during the first approximately 150 to 200 years of recovery, and does not evaporate, is predicted to infiltrate into the floor of the pit and discharge into the carbonate aquifer system (JSA 2010b). The estimated rate of infiltration is approximately 75 afy (50 gpm) at the initial stage of recovery, increases to approximately 150 afy (90 gpm) by Year 100..."* (p.3.4-32). And in the next paragraph states: *"The pit water captured in the South, East, and North Pit lakes would have an initial pH of approximately 7.3 to 7.5 and a TDS of 600 to 900 mg/l (Figures 3.4-9 and 3.4-10, respectively). The TDS is predicted to gradually decrease as the highwall is rinsed by meteoric water. A sharp increase in the TDS concentrations would occur when inflow from the carbonate aquifer begins."*

Letter N1 Responses

N1-1 A discussion of the potential effects to water quality resulting from groundwater flow through the backfilled pits has been added to Section 3.4.2.3 in response to this comment.

N1-2 A discussion of the potential effects to water quality resulting from groundwater flow through the backfilled pits was added to Section 3.4.2.3. The results of the analysis indicate that the chemical load in water that contacts the waste rock would end up in the North Pit due to the hydraulic gradient that would develop in the area surrounding the pit lake. Therefore, the groundwater that encounters the waste rock in the backfilled pits is not expected to degrade the downgradient aquifer system. The capture of this water in the pit lake would not occur if the alternative were modified to eliminate the North Pit lake. Complete backfill was considered but eliminated because of the potential gold resource still in the ground. Backfill would limit potential future gold production.

Letter N1 Continued

N1-3 The infiltration water is expected to exceed drinking water standards for antimony, arsenic, fluoride, manganese, nickel, selenium, thallium, and TDS (see Table 3.4-11). The DEIS argues that antimony exceedence is immaterial since the both the average and maximum levels for the carbonate aquifer is greater than that for the infiltration water, thus no degradation. However, this is a very thin margin. There should be a comparison using actual groundwater samples from the project area, especially since the carbonate aquifer is one of three sources of water inflow to the pits all of which will receive the infiltrating water. In addition, averages are a poor choice for comparison, BLM should use median values, which better tracks with most probable values.

N1-4 Expected average arsenic levels are greater for the infiltration water versus the carbonate aquifer, so on average the groundwater would be degraded, but the maximum for the carbonate aquifer is much higher. Manganese and sulfate are expected to degrade water based on the data in table 3.4-11, where the average for the infiltration water is 0.094 mg/L and 260.9 mg/L with a high of 0.306 mg/L and 410.6 mg/L for manganese and sulfate respectively and for the carbonate aquifer the average values are 0.013 mg/L and 77.0 mg/L with high values of 0.092 mg/L and 160 mg/L for manganese and sulfate respectively. While the average selenium, thallium, and nickel values for the infiltration water while do not exceed the drinking water standard, the high values are greater than the standard. Thus, there is a potential to degrade groundwater.

N1-5 There are no listed values for TDS of infiltration water, yet as quoted above and illustrated in Figure 3.4-10 of the DEIS TDS the infiltrating water is expected to be greater than standards and in excess of the average carbonate level.

N1-6 The DEIS on page 3.4-37 discusses data on the Bootstrap Formation, flow path, and fate analysis concluding that infiltration is "not likely to adversely affect the carbonate aquifer." This aspect of the proposed action is very significant since this pertains to "Waters of the State" and potential degradation. BLM should present more information in the on this modeling calculation including uncertainty analysis. According to state law it is unlawful if a project has the "potential to degrade the groundwaters of the State" (NAC 445A.429). In our view of this language "not likely" does not deny that there exists a potential to degrade.

N1-7 In addition, the eventual water quality of the pit lakes will be poor with elevated constituents of fluoride, manganese, sulfate, and TDS above standards and the assumed background water in the carbonate aquifer, so groundwater is being degraded in the long-term as well. The DEIS states that since the pit lakes are terminal lakes there is no degradation of State of Nevada water; however, the water entering the pit lakes is of higher quality than the pit lake water, so this water is ultimately degraded.

<u>Beneficial Use of Pit Lakes</u>

N1-8 The DEIS does not contain any mention of beneficial uses of the pit lakes, which can be established by the State of Nevada. GBRW recommends that at the very least a recreational beneficial use of the pit lakes be applied.

<u>Conclusion</u>

N1-9 All of the water quality analysis also hinges on effective rock and pit wall geochemical analysis. GBRW has not reviewed this analysis in detail; however, this kind prediction process is notoriously uncertain, which creates even more doubt that this project will not degrade state water. BLM needs to present an uncertainty discussion on the geochemical analysis, so to allow a reasonable understanding of the potential to impact water quality.

N1-10 Overall, the DEIS does not present a convincing case that the infiltration water will not degrade waters of the state, and assumes that long term water quality in the pit lakes does not degrade water of the state.

Letter N1 Responses Continued

N1-3 The data summarized in Table 3.4-11 for the carbonate aquifer is based on sampling of 24 wells completed within the aquifer. This sample series is considered to be the most representative data set for defining the baseline water quality for the regional carbonate aquifer for this EIS analysis. Presentation of the calculated average (or mean) chemical concentrations for a series of wells completed in the same aquifer is one of many reasonable and useful statistical parameters commonly used to characterize the baseline water quality groundwater aquifers.

No changes have been made to the Draft EIS to respond to this comment.

N1-4 The statements regarding the potential to degrade groundwater are incorrect and don't reflect the results of the attenuation bench testing and fate and transport modeling conducted for the EIS to evaluate the potential impacts to groundwater from pit water infiltration prior to pit lake development. As tabulated in Draft EIS Table 3.4-11, the outflow from one or more of the pits prior to pit lake development would exceed the Nevada secondary standard of 0.1 mg/L for manganese. However, the results of the fate and transport evaluation indicates that manganese readily forms solid phases such that the added manganese contribution from the pit infiltration will not result in an increase in groundwater concentrations downgradient from the pit shell area (Geomega 2011; Schafer 2011b).

The predicted average and maximum sulfate concentration (410.6 mg/L and 260.9 mg/L, respectively) of the pit infiltration water are below the Nevada Secondary Standard (i.e., MCL) for drinking water; therefore sulfate is not predicted to impact the use of groundwater as a potential drinking water supply.

The fate and transport evaluation also indicated that selenium, thallium, and nickel concentrations would be attenuated through absorption processes and therefore, not degrade water quality in the downgradient carbonate aquifer system.

No changes have been made to the Draft EIS to respond to this comment.

N1-5 The values for TDS were added to Table 3.4-11 for comparison in response to this comment. As discussed in footnote 6 to Table 3.4-11 in the Draft EIS, "the TDS is dominated by calcium and bicarbonate ions, whose high concentrations are an artifact of the very high partial pressure of carbon dioxide determined for the carbonate aquifer. If atmospheric carbon dioxide levels are applied, the resulting average TDS values are less than 500 mg." In other words, the TDS in the

Letter N1 Responses Continued

N1-5 Cont infiltrating water from the pits is predicted to be below 500 mg/l under atmospheric conditions; but would increase in the deeper aquifer due to calcite dissolution. Because the TDS concentrations are predicted to be below 500 mg/l under atmospheric conditions; and the Nevada enforceable secondary standards for drinking water is 1,000 mg/l, the TDS is not predicted to impact the use of groundwater as a potential drinking water supply. In addition, the predicted flow rates for the pit infiltration water are very small compared to the overall flow within the carbonate aquifer. As a result, it is reasonable to assume that the predicted TDS load from the pit infiltration would be difficult to detect outside the project boundary due to dilution and dispersion processes in the carbonate aquifer

N1-6 A comprehensive description of the calculations methodology and results were incorporated by reference in this section of the Draft EIS (e.g., Geomega 2011; Schafer 2012b, 2011b). As stated in the Draft EIS, the results of the solute transport modeling indicate that elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits.

No changes have been made to the Draft EIS to respond to this comment.

N1-7 The evaluation of impacts to water quality associated with the pit lakes was based in part on comparison to State and Federal water quality standards for designated or applicable beneficial uses. The pit lakes are not predicted to discharge to groundwater; therefore, drinking water standards do not apply to the pit lake water. Impacts to wildlife associated with exposure to the pit lakes was addressed separately in an ecological risk assessment that is summarized in Section 3.17, Wildlife and Aquatic Biological Resources. No other reasonable beneficial uses for the pit lake water have been identified.

No changes have been made to the Draft EIS to respond to this comment.

Letter N1 Responses Continued

N1-8 Recreational access to the bottom of the pit is not feasible for the long term. Rock fall and localized instability of the mining roads and benches present considerable risk to public and terrestrial wildlife safety.

No changes to the Draft EIS have been made in response to this comment.

N1-9 BLM has determined that sufficient geochemistry data and analysis are provided in the Draft EIS to allow for a reasoned decision of the proposed action and its alternatives.

No changes to the Draft EIS have been made in response to this comment.

Letter N1 Continued

N1-10 Cont BLM needs to work with Barrick-Dee Mining Venture Inc. to develop an alternative mine plan that will clearly not violate state law. Therefore, GBRW does not support the proposed action at this time.

N1-11 Please feel free to contact GBRW if any clarification and we are open to discussions with BLM and Barrick-Dee Mining Venture Inc. regarding our comments.

Sincerely,

John Hadder

John Hadder, Director
john@gbrw.org

cc: Bruce Holgren, Bureau of Mining Regulation and Reclamation

Letter N1 Responses Continued

N1-10 Comment noted.

N1-11 Comment noted.

Letter N2 Continued

BIG SMOKEY WESTERN SHOSHONE DESCENDANTS (BSWSD)
1949 Circle way, Elko, NV 89801
PH: 775-738-6602 FAX: 775-738-6267

February 27, 2013

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RECEIVED
BUREAU OF LAND MANAGEMENT
ELKO OFFICE

Bureau of Land Management
Attn.: Mr. John Daniel, District Manager
Elko District Office
3900 E. Idaho Street
Elko NV 89801

RE: RESPONSE TO DRAFT "ENVIRONMENTAL IMPACT STATEMENT" FOR THE ARTURO MINE PROJECT

Dear Mr. Daniel:

N2-1 I am writing to convey the BSWSD's concerns regarding the "Draft Environmental Impact (EIS) Arturo Project" by the Bureau of Land Management (BLM). Our review – as representatives of our Tribe, the Western Shoshone who occupied the Boulder Creek Valley area – of the project is reflective of our active participation in the EIS process since the submittal of the "PLAN" in 2011 as native monitors.

We engaged in joint meeting consultations and provided on-going comments to be included in the "Draft EIS." It was our sincere hope that our past continuous interactive dialogue, on site observations, inspections and research would not only help to *identify* culturally sensitive sites but (1) aid in the *preservation* of our cultural history for our future descendants and (2) aid in further archaeological study by institutions of higher learning.

N2-2 Unfortunately and most disturbing, it appeared that some of these sites were bulldozed, if not destroyed, which is contrary to federal requirements and the objectives of BLM. It is imperative that acts of this nature be investigated and prevented in the future whether deliberate or accidental. The public relations goals of both the BLM and the Barrick Gold project could have devastating consequence on both entities if this destructive act becomes known to the general population.

N2-3 As Neighbors of the Barrick/Arturo Mine, we have a cooperative and economic interest in promoting the continuation of mining operations here, a part of Nevada. The benefits or mining accrue across racial lines, to include our native people. The direct and indirect benefits of mining help Nevadans across many economic sectors. Most importantly, the "written" history of the Western Shoshones' ancient communities exists in the remnants of their pottery, tools, awls, obsidian flakes / points / projectiles, rock art, fire pits, etc. and is at peril here if not properly recognized and recorded – the main reason for the participation of native monitors who culturally envision the interconnectivity of all things and their dependence upon each other in the promotion of maintaining a balanced way of living. Yes, mining is necessary, but... so is one's history.

Letter N2 Responses Continued

N2-1 The BLM acknowledges the observations, input, and on-site efforts of numerous Tribal governments and other Tribal entities, including the BSWSD. The information provided by all Tribal interests was utilized fully in the cultural resource work done. These data were used in surveying for the location of archaeological properties under Section 106 of the National Register of Historic Places Act and analysis of those sites for determination of their eligibility to the National Register of Historic Places (NRHP). The information provided also aided in the creation and execution of the Treatment Plan for the data recovery of Historic Properties (i.e., sites determined to be eligible for inclusion in the NRHP) in danger of adverse effect from planned project activities.

The BLM acknowledges that in-place preservation of Historic Properties is always the optimum outcome. In instances where in-place preservation was not possible, sites were excavated and the data analyzed under the Treatment Plan. All of the consulting Tribal governments were offered the opportunity to consult in the creation of the Treatment Plan which was subsequently approved by the Nevada State Historic Preservation Officer.

The data recovery was conducted at 25 Historic Properties within the Draft EIS footprint and served to locate, analyze, and preserve those data available at these sites. These data has added to and will continue to add to the region-wide academic database and be a solid base for future studies.

No changes have been made to the Draft EIS text in response to this comment.

N2-2 The only archaeological sites damage within this project area of which we are aware are either (1) sites not eligible to the NRHP and therefore not actively managed, or (2) upon investigation sites determined to have been damaged long ago.

No Historic Properties or sites without an eligibility determination have, to our knowledge, been damaged during current activities or by the current mine interest.

No changes have been made to the Draft EIS text in response to this comment.

N2-3 Comment noted.

Letter N2 Continued

N2-4 This brings us to the matter of the EIS Draft. Although, it lists 25 sites in the Plan of Operation (PoO) as "Prehistoric Lithic Scatter" there is NO mention of particular findings such as those mentioned in the previous paragraph and reported by the Native Monitors in their daily /weekly log / reports. The comment of the ..... SWCA saying, "It was insignificant" is paramount to saying it is non-existent *or* putting the finding on the same level as sagebrush growing in the area and is "insignificant" to the purpose of having monitors present on the site. These finding are "significant" and are specifically mentioned in the federal government's regulations.
Time and money (was their primary concern), as addressed by SWCA "this comes at a cost." However, as we see it, that site will not be available for study in the future when advances in archaeological methods / theory make it possible to enhance discovery. Given our concerns, it appears that the archaeological data findings would be eligible for NRHP under Criteria D. Additional study on the sites would provide a public benefit in that it would advance our understanding of the prehistory and history of the Western Shoshone people.

N2-5 In conclusion, the EIS process for the "Arturo Mine Project" has **not** been thorough and comprehensive. After all the work completed by the BLM and those that have participated in the proceedings, it is vital that the review of the "Draft EIS" for this project be delayed or extended for additional examination. The EIS report / information given by Barrick's contractor / SWCA will have a detrimental effect on the Western Shoshone regionally and historically. We look forward to hearing from you in regard to seeking a resolution to this problem. Your effort is appreciated.

Respectfully submitted,

Mr. Felix Ike, Lead (BSWSD)

cc: Honorable Senator Reid, Senator
Randy Burggraff, Barrick North America
Te-Moak Tribe
Ely Shoshone Tribe
Duckwater Shoshone Tribe
Yomba Shoshone Tribe
Duck Valley Shoshone Tribe

Letter N2 Responses Continued

N2-4 N2-4a: The Draft EIS was completed prior to the completion of data recovery analysis and reporting. As the Draft EIS defined that the 25 Historic Properties would be data recovered prior to project implementation, this is correct and appropriate.

Data from the final data recovery report would not normally be included within the Draft EIS or the Final EIS. These data are exempt from the Freedom of Information Act, but would be available to researchers and Tribal governments having a current Data Sharing Agreement with the BLM.

The information presented to us in the data recovery report has now been integrated into our databases and has added substantively to our overall knowledge of pre-contact life in this area. This information will aid our future Section 106 planning efforts, our location and protection of Historic Properties in the region, and will better inform our work in understanding and documenting pre-contact lifeways.

N2-4b: The use of the term "significance" here is used only as the legal language of NRHP eligibility determinations: does the site meet the criteria as defined by Advisory Council on Historic Preservation (ACHP) guidance, i.e., can the site be defined as "significant" or "eligible to the NRHP".

"Significant" here is not a value judgment either of the artifacts located, the people who created those artifacts, or the communities who express a link to those earlier communities.

Thorough data collected from those sites determined not eligible to the NRHP, or "insignificant" is in the form of site location, site constituents or contents number and type, potential for site depth or a subsurface component, and any other relevant data. These data are available for future researchers. Further, a professional determination that a site is not eligible or is "insignificant" does not mean that the site will be destroyed, rather that the site will not be actively managed.

N2-4c: It is BLM policy not to explain statements made by third parties. As stated above, a professional determination that a site is not eligible or is "insignificant" does not mean that the site will be destroyed, rather that the site will not be actively managed.

N2-4d: Under the guidance as provided by the ACHP, archaeological sites are evaluated for their eligibility to the NRHP under the following criteria: "Criteria for evaluation. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and

Letter N2 Responses Continued

N2-4 Cont association and [one of the following a-d] that have yielded, or may be likely to yield, information important in prehistory or history."

To be considered eligible to the NRHP, the site must meet the language in the first paragraph and then any one or more from criterion a through criterion d.

No text was changed in the Draft EIS to respond to this comment.

N2-5 The Section 106 documentation, including the inventory survey, the data recovery treatment plan, and the data recovery final reporting met all of the legal, regulatory, and scientific requirements of the archaeological profession. The reports were found by the BLM and the Nevada SHPO to meet all requirements, and the BLM found the report to be both thorough and comprehensive above those requirements as spelled out in the treatment plan.

No change to the Draft EIS was made to respond to this comment.

Letter P1

faxZERO
Send a fax for free

Recipient Information

To: John Daniel
Fax #: 7757530255

Sender Information

From: Barbara Leonard
Email address: blpaints@hotmail.com (from 67.44.205.129)
Sent on: Tuesday, January 22 2013 at 5:12 PM EST

P1-1 **RE: Arturo Mine Project Draft EIS Water for mining, water for welfare cattle, but NO WATER for wild horses? You surely must think taxpayers are complete idiots. Barbara Leonard, 4574 State Highway V, Seymour MO 65746.**

Letter P1 Response

P1-1 Comment Noted.

4.0 References (updated since Draft EIS December 2012)

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Appendix A

Revised Section 3.4, Water Resources and Geochemistry

3.4 Water Resources and Geochemistry

3.4.1 Affected Environment

3.4.1.1 Hydrologic Setting

The proposed project is located within the Humboldt River basin in north-central Nevada. The proposed project area is composed of the area encompassed by the Plan of Operations (PoO) boundary, the Bootstrap Haul Road, power connection yard, secondary access road entrance, and the power transmission line corridor that occurs outside the project PoO boundary. These features are indicated in **Figure 2-2**. The Humboldt River flows westward within a closed basin that terminates at the Humboldt Sink south of Lovelock. The entire Humboldt River basin covers an area of nearly 17,000 square miles.

The proposed project is located within the Boulder Creek watershed within the Boulder Flat Hydrographic Area 61 (**Figure 3.4-1**). The headwaters of Boulder Creek are in the Tuscarora Mountains located east of the proposed project. The hydrologic study area for direct and indirect impacts to water resources consists of the project area and the upper Boulder Creek watershed including tributaries that join Boulder Creek upgradient of Rodeo Creek (approximately 0.25 mile upgradient of Boulder Valley Monitoring Plan (BVMP) monitoring station BC-A located in **Figure 3.4-2**). ***Due to the footprint of the proposed West Waste Rock Disposal Facility (WRDF), the study area for direct and indirect project impacts also extends into 275 acres of the Antelope Creek watershed in the northwest portion of the PoO boundary. No direct or indirect project impacts would occur upstream of BVMP monitoring station ANT-1 (Figure 3.4-3). Downstream of the proposed project area, Antelope Creek monitoring has been conducted at stations ANT-2 and ANT-3 (Figure 3.4-3) for a number of years (Barrick Goldstrike Mines Inc. [BGMI] 2010). Station ANT-2 reflects water from both Antelope Creek and Little Antelope Creek; the latter drains the watershed around the proposed Hollister Project. Therefore, the study area boundary for direct and indirect effects from the proposed Arturo Mine project is upstream of ANT-2, reflecting the sub-watershed where drainage from the project area could contribute to Antelope Creek. This is further discussed in Section 3.4.2.***

This comprises a ***study*** area of approximately ***39*** square miles (approximately ***24,960*** acres). Elevations in the study area range from approximately 6,100 feet above mean sea level (amsl) along the watershed divide, to approximately 5,200 feet amsl along Boulder Creek (**Figure 3.4-2**).

The Cumulative Effects Study Area (CESA) for water resources encompasses six designated hydrographic basins and approximately 2,105 square miles. These six hydrographic basins are listed in **Table 3.4-1** and shown in **Figure 3.4-1**. All six basins drain southward to the Humboldt River. The CESA is bounded by the Tuscarora Mountains on the north, the Adobe Range and the Independence Mountains on the east, and the Humboldt River on the south. The western boundaries of the Willow Creek and Rock Creek groundwater basins form the western boundary of the CESA. Elevations within this CESA range from 8,800 feet amsl in the Tuscarora Mountains to 4,500 feet amsl along the Humboldt River. The CESA for water resources in this Environmental Impact Statement (EIS) is identical to the CESA analyzed in the Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project (Bureau of Land Management [BLM] 2000b), Betze Project Draft Supplemental EIS (BLM 2000c), Betze Pit Expansion Project Draft Supplemental EIS (BLM 2008b), Leeville Project Final Supplemental EIS (BLM 2010b), and South Operations Area Project Amendment Cumulative Effects Final Supplemental EIS (BLM 2010a).

Table 3.4-1 Hydrographic Basins Within the CESA for Water Resources

Nevada Designated Hydrographic Basins	Basin Number	Approximate Land Area (square miles)
Susie Creek Area	50	220
Maggie Creek Area	51	410
Marys Creek Area	52	60
Boulder Flat	61	560
Rock Creek Valley	62	450
Willow Creek Valley	63	405

Sources: Maurer et al. 1996; Nevada Division of Water Resources (NDWR) 2010a.

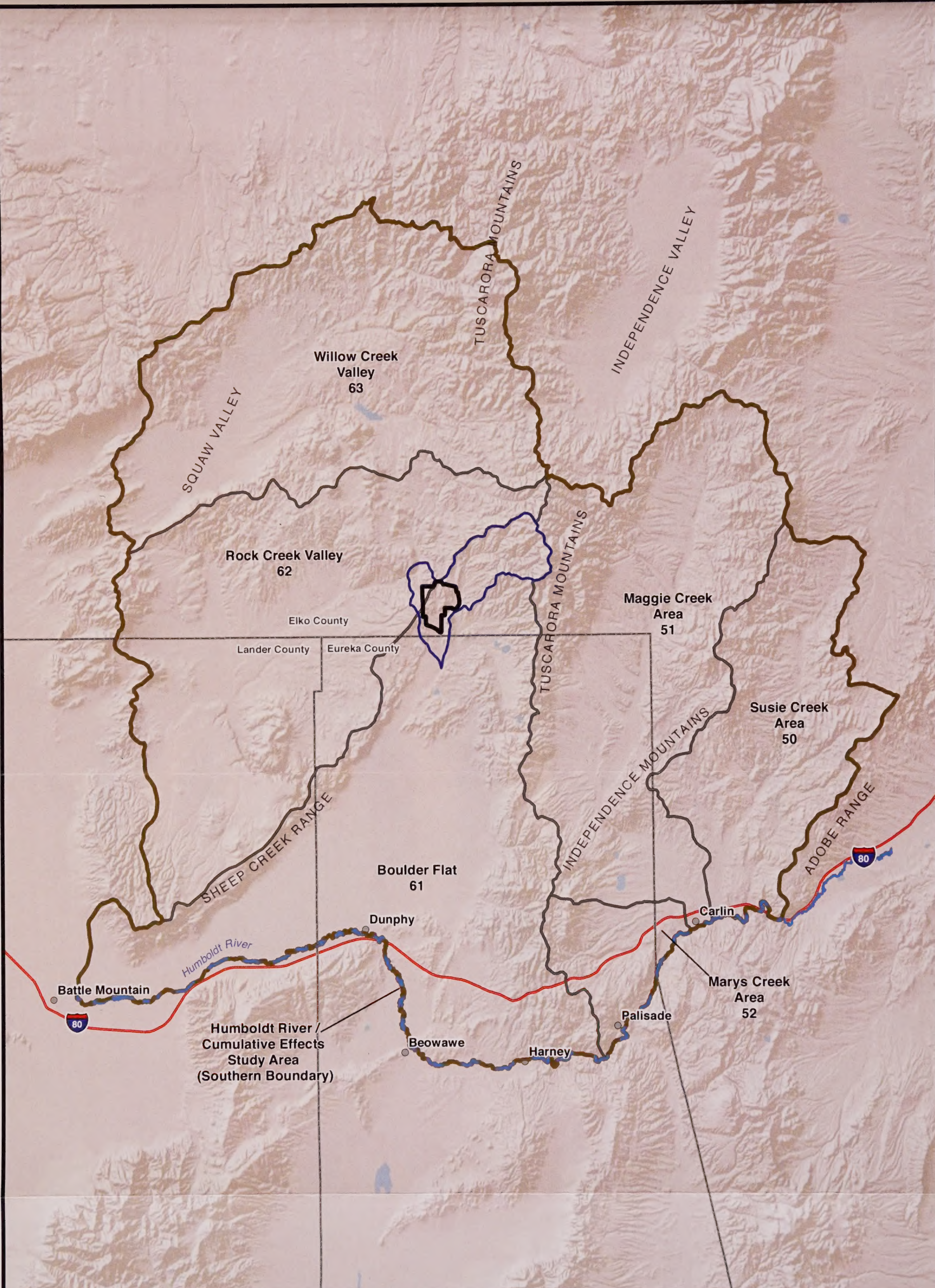
Regionally, the average annual precipitation varies, but it generally increases with elevation. Most of the precipitation falls during winter and spring. Historically, total annual precipitation generally has ranged from 14 to 20 inches at higher elevations in the Tuscarora Mountains to less than 10 inches at lower elevations on Boulder Flat (U.S. Department of Agriculture-Natural Resources Conservation Service 1998). In the study area, the average annual precipitation is approximately 10.7 inches (SRK Consulting [U.S.], Inc. [SRK] 2010a). The months of July, August, and September are relatively dry, and most precipitation occurs during November through March. The average annual lake evaporation is approximately 44.6 inches (SRK 2010a), far exceeding precipitation amounts. Most rainfall and snowmelt is removed by evapotranspiration; the remainder recharges groundwater.

3.4.1.2 Surface Water Resources

This section describes surface water resources from the standpoint of water quantity, water quality, and related features such as stream channels, diversions, ponds, and springs. It also describes water features for subsequent assessment of potential impacts to water quantity and quality. Habitat features, ecological relationships, and other biological or terrestrial considerations have been included by reference, but are assessed in detail in other sections of the EIS.

Streams and Ponds

The study area is dominated by unnamed, relatively steep, ephemeral channels that drain towards Boulder Creek. Boulder Creek is located immediately east of the proposed PoO boundary (**Figure 2-2**). Investigators mapped eight ephemeral stream channels within the study area, including three segments that no longer reach Boulder Creek (JBR Environmental Consultants, Inc. [JBR] 2009). Typical streambed slopes within the study area range from 1 to 5 percent (approximately 50 to 260 feet/mile) (Cedar Creek Associates, Inc. [Cedar Creek] 2009). The channel beds are generally less than 2 feet wide, and the depths are shallow, typically 2 inches or less (JBR 2009) indicating low flow rates. The channel substrates are usually gravelly but can be composed of coarser cobbles where larger flows have occurred. Field investigations indicate that annual vegetation similar to the adjacent plant community is common within the ephemeral channels, indicating that flows in these streams typically occur before most of the growing season (JBR 2009).



Legend

- Proposed PoO Boundary
- Cumulative Effects Study Area
- Groundwater Basin Boundary
- Study Area for Potential Direct/Indirect Impacts

N

0 2.5 5 Miles

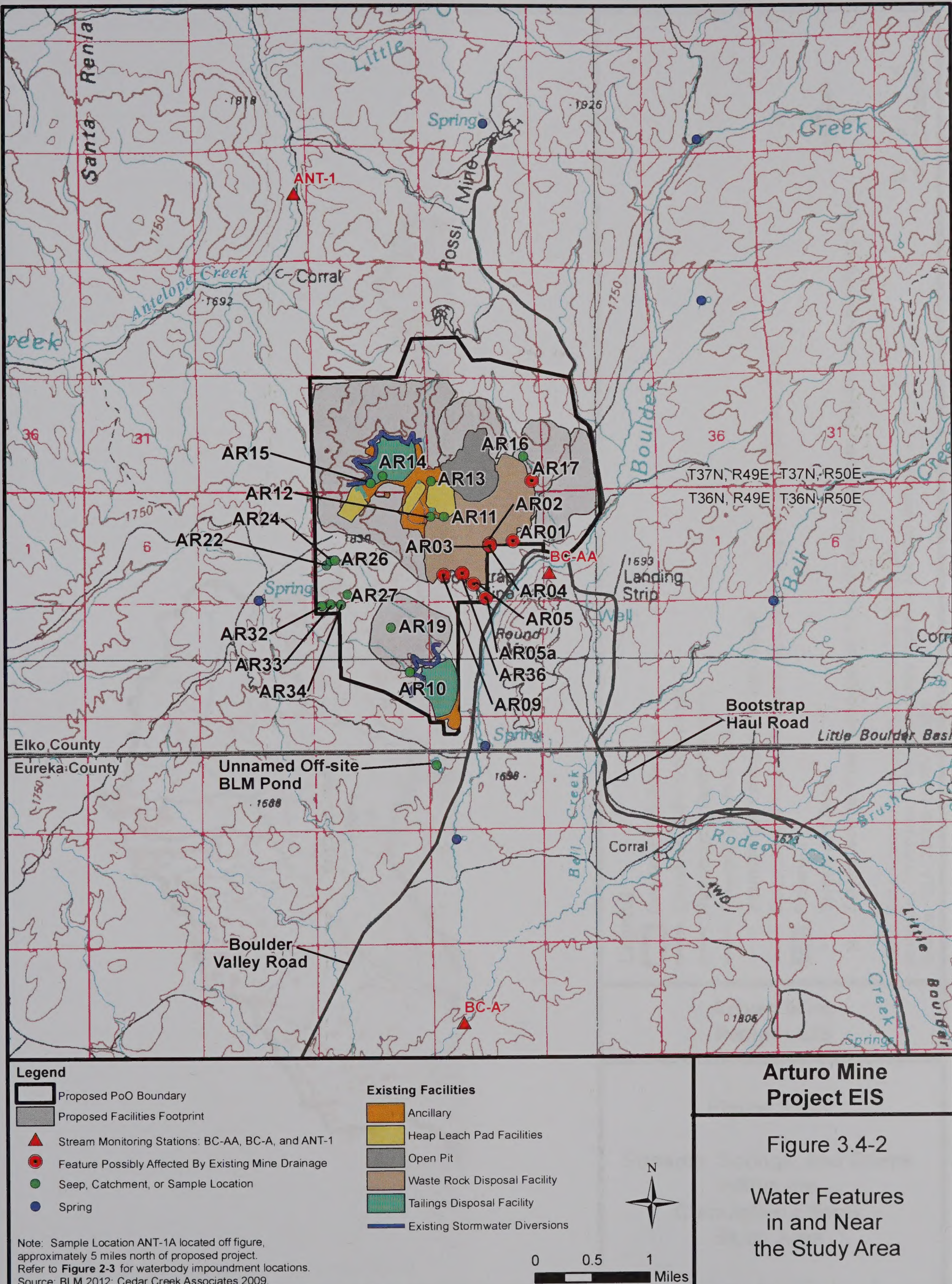
Source: NDWR 2010a.

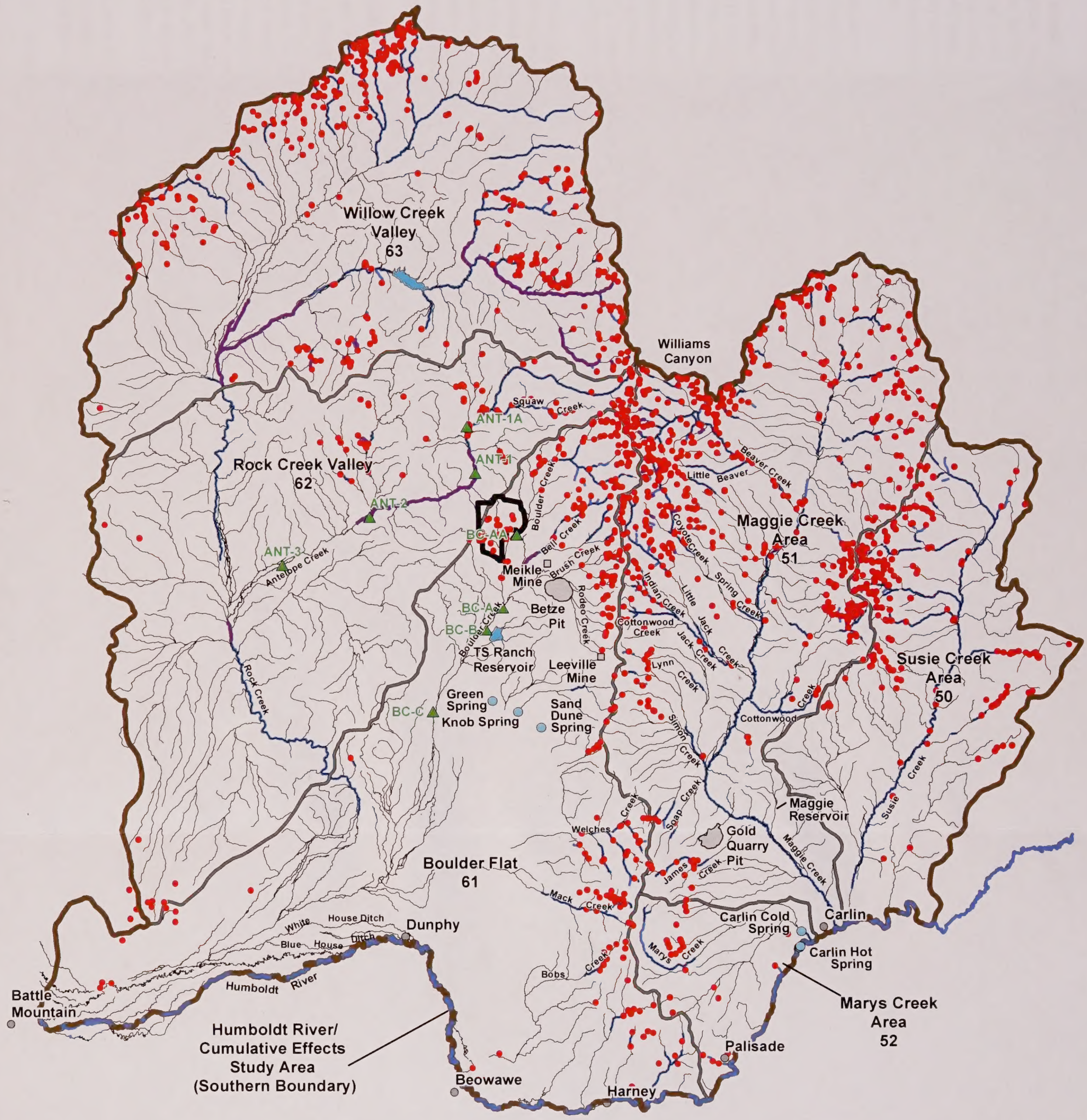
Arturo Mine Project EIS

Figure 3.4-1

Water Resources Study Areas for Direct/Indirect and Cumulative Effects

05/16/2012


Santa Renia
Little
Spring
Creek
ANT-1
Rossi Mine
Antelope Creek
Corral
Creek
Boulder
AR15
AR14
AR16
AR17
AR13
AR12
AR11
AR02
AR24
AR01
AR22
AR03
AR26
BC-AA
Landing Strip
Spring
AR27
AR04
AR05
AR19
AR32
AR05a
AR33
AR36
AR34
AR10
AR09
T37N, R49E T37N, R50E
T36N, R49E T36N, R50E
Bootstrap Haul Road
Little Boulder Basin
Elko County
Eureka County
Unnamed Off-site BLM Pond
Spring
Bell Creek
Corral
Rodeo
Brush
Little Creek
Boulder Valley Road
BC-A
Legend
Proposed PoO Boundary
Proposed Facilities Footprint
Stream Monitoring Stations: BC-AA, BC-A, and ANT-1
Feature Possibly Affected By Existing Mine Drainage
Seep, Catchment, or Sample Location
Spring
Existing Facilities
Ancillary
Heap Leach Pad Facilities
Open Pit
Waste Rock Disposal Facility
Tailings Disposal Facility
Existing Stormwater Diversions
N
0 0.5 1 Miles
Note: Sample Location ANT-1A located off figure, approximately 5 miles north of proposed project.
Refer to Figure 2-3 for waterbody impoundment locations.
Source: BLM 2012; Cedar Creek Associates 2009.
Arturo Mine Project EIS
Figure 3.4-2
Water Features in and Near the Study Area



Legend

- Proposed PoO Boundary
- Cumulative Effects Study Area
- Hydrographic Basin Boundary
- Perennial Stream Reach
- Intermittent or Ephemeral Stream Reach
- Discontinuous Flowing Stream Reach (interrupted flow that stops and starts)
- Reservoir
- Springs and Seeps
- Existing Boulder Creek and Antelope Creek Monitoring Stations, Boulder Valley Monitoring Plan

Note: Stream locations are taken from USGS line graph database. Hydrographic basin boundary locations are approximate.
Source: BLM 2000b; BDMV 2010a.

Arturo Mine Project EIS

Figure 3.4-3

Streams, Springs, and Seeps Within the Cumulative Effects Study Area

2014

5/17/2013

The BVMP was approved by regulatory agencies and implemented by Barrick in 1990. The program monitors wells, springs, and streams in Boulder Valley and nearby watersheds. As part of the BVMP, flows in Boulder Creek near the study area are monitored monthly in the northwest quarter of the southwest quarter, Section 2, Township 36 North, Range 49 East (BC-AA) (Barrick Dee Mining Venture [BDMV] 2010e). Recent discharges range from dry in late February 2010, up to 12,640 gallons per minute (gpm) (28.2 cubic feet per second) in late May 2009. The maximum recorded recent flow in Boulder Creek adjacent to the proposed PoO boundary was 37,221 gpm (82.9 cubic feet per second) in late April 2006 (BDMV 2010e). The stream is typically dry from late June or July until March.

Based on a review of aerial photography and existing data, three small impoundments that are used for runoff and sediment control or stock watering exist within the study area. The largest of these is approximately 2 acres in size encompassing locations AR36 and AR09, which was built in 1964 by the BLM as a detention pond to reduce sedimentation in Boulder Creek resulting from wildfires. An additional impoundment (including sample site AR05) is located downgradient within the PoO boundary. The upper impoundment (including sample sites AR09 and AR36) receives direct surface runoff from the existing Dee project components as well as ***naturally occurring flow that has been routed*** through a limestone-lined ***French*** drain ***that was placed during construction of the existing WRDF***. The lower impoundment was originally created as a temporary stock watering feature. Both of these ponds seep, allowing the formation of wetlands. As discussed above, the upgradient 2-acre pond was originally constructed as a detention pond, which means this impoundment was designed and constructed to leak and temporarily hold a minimal amount of water. This impoundment was modified by the Dee Gold Mining Company over time. Wetland features and ecology are discussed in Section 3.14, Vegetation, Including Riparian Zones and Wetlands.

The third impoundment noted in **Figure 2-3** (without a reference number) is ***an unnamed BLM*** detention pond located outside the project area in Section 15, Township 36 North, Range 49 East. It receives ***supplemental*** runoff ***diverted*** from the ***watershed upstream of*** Tailings Disposal Facility No. 2 (TD2). This impoundment was originally constructed by the BLM in 1964 to reduce sedimentation in Boulder Creek from wildfires that occurred then. ***It is not owned by BDMV, or located in the TD2 drainage. Based on inspection of several historical aerial photographs taken in different years and field surveys conducted by SRK and Cedar Creek Associates, the TD2 facility does not seep or create downstream wetland features.***

<u>Springs and Seeps</u>

On-site investigations have identified 22 seeps and associated features within the study area that contain free surface water or are associated with wet soils (Cedar Creek 2009; SRK 2010b). An additional detention pond (AR36) was constructed in 1964 and was added to the sampling program in 2009. These features are listed in **Table 3.4-2**. Several of these are apparently associated with historic sediment and runoff control features, while others are at or near the toes of the existing WRDF (Cedar Creek 2009). The locations of known seeps and springs in the study area are indicated in **Figure 3.4-2**. Water quality data have been retrieved at or near the free-water features, but no flow monitoring is known to exist at the sites. Based on site visit records, flows are either non-existent or small and seasonal (Cedar Creek 2009; JBR 2009). Additional discussion of biological or ecological resources occurring at the springs and seeps is presented in Section 3.14, Vegetation, Including Riparian Zones and Wetlands, or in Section 3.17, Wildlife and Aquatic Biological Resources.

A number of other springs are known to be located near the proposed PoO boundary, either within the study area or nearby in the CESA (**Figure 3.4-2**). Based on United States Geological Survey (USGS) topographic maps, the closest springs to the proposed PoO boundary are unnamed features located:

- In the southwest quarter, Section 13, Township 37 North, Range 49 East;
- In the southeast quarter, Section 15, Township 37 North, Range 49 East;

- In the northeast quarter, Section 25, Township 37 North, Range 49 East;
- Near the south quarter corner, Section 5, Township 36 North, Range 49 East;
- In the northwest quarter, Section 15, Township 36 North, Range 49 East;
- In the northwest quarter, Section 22, Township 36 North, Range 49 East; and
- At the southwest corner, Section 6, Township 36 North, Range 48 East.

These nearby water features are depicted in **Figure 3.4-2** along with the seeps and other features listed in **Table 3.4-2**. No recent flow or water quality data are known to exist for these nearby locations. Other springs are identified upstream of the proposed PoO boundary in the headwaters of Boulder Creek watershed, as indicated in **Figure 3.4-3**.

Table 3.4-2 Seeps and Other Features Within the Study Area

Inventory Number	Feature Type	Related Existing Facility
AR01	Seep wetland, occasional open water	Yes
AR02	Probable seep	Yes
AR03	Seep	Yes
AR04	Seep	Yes
AR05 and 05a	Drainage bottom wetlands and pond, open water	Yes
AR09	Sampling location on upstream end of BLM detention pond; wetland, spring and open water	Yes
AR10	Seep or catchment	No
AR11	Mostly dry mine constructed basin	No
AR12	Mostly dry mine-excavated area	No
AR13	Seep or catchment	No
AR14	Remnant constructed collection pond	No
AR15	Remnant constructed collection pond	No
AR16	Seep and marginal wetlands	No
AR17	Drainage bottom wetland	Yes
AR19	Seep	No
AR22	Seep or catchment	No
AR24	Seep or catchment	No
AR26	Seep or catchment	No
AR27	Seep wetland	No
AR32	Seep or catchment	No
AR33	Seep or catchment	No
AR34	Seep or catchment	No
AR36	Sampling location on downgradient end of BLM detention pond; open water	Yes

Source: Cedar Creek 2009.

Streams, springs, and seeps within the CESA are shown in **Figure 3.4-3**. Based on ***BVMP*** flow monitoring data, Boulder Creek is intermittent in its upper reaches to the east of the proposed PoO boundary (BGMI 2010). Downgradient along the channel toward Rodeo Creek, evapotranspiration and seepage losses into the stream alluvium reduce the flow duration in Boulder Creek to ephemeral conditions (BLM 2008b, 2000c, 1991a). Downgradient in Boulder Valley (also known as "Boulder Flat"), these temporary channel flows are routed into a series of agricultural diversions in combination with Rock Creek flows (JBR 2009). Boulder Creek is ephemeral on the valley surface of Boulder Flat. Boulder Creek has no hydrologic connectivity with Rock Creek ditch or the Humboldt River as discussed below in Waters of the United States. ***BVMP monitoring locations along Boulder Creek and Antelope Creek are depicted on Figure 3.4-3.***

East of the Tuscarora Mountains, major tributaries to the Humboldt River include Maggie Creek, Marys Creek, and Susie Creek (**Figure 3.4-3**). These drainages have been extensively investigated by Maurer et al. (1996), the USGS (Prudic et al. 2006), and others. Maggie Creek and Susie Creek are dominantly perennial streams (BLM 2008b). West of the Tuscarora Mountains, Rock Creek is the major tributary to the Humboldt River within the CESA. That channel traverses the southwestern portion of Boulder Valley before joining the river near the town of Battle Mountain (**Figure 3.4-3**). Further detail about flows in Boulder Valley and other streams in the CESA was provided in previous National Environmental Policy Act (NEPA) documents (BLM 2008b, 2000b,c, 1991a).

Flood Hydrology

No regulatory floodplain (Flood Hazard Zone A) delineations have been made by the Federal Emergency Management Agency (FEMA) in the study area or nearby along Boulder Creek (FEMA 2010). The nearest FEMA Zone A delineation on Boulder Creek is located approximately 1 mile south of the Elko-Eureka county line, downgradient of a point approximately 1.2 miles north of Rodeo Creek. From a geomorphic perspective, narrow floodplain deposits or low-lying areas that would be inundated from a large precipitation or snowmelt event occur along all of the ephemeral streams in the proposed project area. Inundated channel areas probably would be on the order of 10 feet wide at most locations (Cedar Creek 2009; JBR 2009) depending on the size of a particular runoff event. The 100-year, 24-hour point precipitation for the study area is 2.60 inches (SRK 2010a).

Waters of the United States

Field investigations to evaluate the potential jurisdictional status of ephemeral channels and wetlands within the proposed project area were performed by JBR in late summer of 2009 ***and in early summer 2013***. All isolated waterbody features that are solely contained in the proposed project area were mapped, as well as features that have a potential tributary connection to Boulder Creek (JBR 2009) ***and Antelope Creek (JBR 2013)***.

The JBR survey documented that the Ordinary High Water Mark associated with Boulder Creek ceases to exist 17.4 stream miles downgradient of the proposed project area (at a location 6.7 miles upgradient of the Rock Creek Ditch) (JBR 2009). The distance from the Rock Creek Ditch to the Humboldt River is approximately 25 miles. Because Boulder Creek lacks a regular or frequent direct connection with the Humboldt River, tributaries of Boulder Creek (and, correspondingly, any associated wetlands) present within the proposed project area were determined to be isolated (JBR 2009). In addition to the lack of any direct channel connection between the proposed project area and downgradient waters, there are no interstate commerce uses for Boulder Creek or for any channel or wetland located within the proposed project area (JBR 2009). The investigation concluded that Boulder Creek, its tributaries, and all waterbody features found in the proposed project area are not subject to federal jurisdiction, and thus not regulated, under Section 404 of the Clean Water Act (JBR 2009). The United States Army Corp of Engineers (USACE) formally concurred with this conclusion in a letter dated August 13, 2010 (USACE 2010).

JBR conducted a survey for jurisdictional waters on the 275-acre portion of the proposed project area that drains towards Antelope Creek in the Rock Creek watershed in June 2013. The field investigation found no Waters of the United States in the survey area (JBR 2013). The survey report was submitted to BLM and the USACE. BDMV would not disturb drainage features in the Antelope Creek watershed until the USACE has concurred with the JBR findings that the area does not contain potentially jurisdiction streams or wetlands that would be subject to regulation pursuant to Section 404 of the Clean Water Act. BDMV would comply with applicable Clean Water Act Section requirements in the case where the USACE did not concur with the JBR survey findings.

Existing Mining Water Management Facilities in the Project Area

As described in Chapters 1.0 and 2.0, a number of mine-water control and process-water management features currently exist within the proposed project area. Existing and authorized disturbance in the proposed project area is depicted in **Figures 2-1** ***and 3.4-2***. Process-water management features for the heap leach facilities, mill, and solution processing facilities have been reclaimed (***SRK 2012***).

Current features include runoff collection and sedimentation impoundments (described above under *Streams and Ponds*), as well as two tailings disposal facilities under various stages of reclamation. The footprint for Tailings Disposal Facility No. 1 (TD1) occupies approximately 87 acres, and the permitted footprint for TD2 occupies approximately 83 acres (***SRK 2012***). The TD1 embankment face has been reduced to a flatter angle for reclamation except where the road to the water tank exists on the dam (Telesto Nevada 2004). TD1 and TD2 have been reclaimed and vegetation has been established. Diversion ditches designed for the 100-year, 24-hour runoff event are in place to divert water around these features ***in accordance with Nevada Division of Environmental Protection (NDEP) and BLM guidance.***

Watersheds

The regional hydrologic setting is described in Section 3.4.1.1, Hydrologic Setting. This watershed discussion examines general runoff conditions over large drainage areas from a hydrologic perspective.

Influences on runoff and sedimentation include snowmelt and rainfall, topography and soil characteristics, vegetation conditions, drainage controls and conservation practices. On a regional basis, overland flow originates from snowmelt or rainfall on hillslopes and more gently sloping alluvial fans and valley floors. Infiltration and porosity are typically greater on the lower depositional features, and runoff is sometimes completely absorbed downslope before reaching a stream channel.

Other land surface influences, such as grazing, fire, mining and exploration activities, and roads, also affect runoff conditions within the study area and CESA. While grazing is the most extensive land use activity within the CESA, rangeland fires are very common. Approximately 59 percent of the water resources CESA, including some of the project study area, has been burned by wildfire (**Figure 3.2-3**). Much of the CESA has been burned by wildfire more than once since 1985. The primary areas where fire has not recently occurred include most of Boulder Flat, and lower elevations in the southwestern part of Rock Creek Valley, and Squaw Valley.

In the CESA, which occupies approximately 2,105 square miles (approximately 1.35 million acres), ongoing disturbance from mines and exploration activities occupies approximately 35,344 acres (approximately 55.2 square miles). This is approximately 2.6 percent of the land area within the water resources CESA. Additional surface disturbance from roads, pipelines, and transmission lines also exists within the CESA.

3.4.1.3 Groundwater Resources

Recharge, storage, and movement of groundwater is dependent in part on the geologic conditions and topography of a site. The general stratigraphic and structural framework throughout the hydrologic study area and the proposed project area are described in Section 3.3, Geology and Minerals. For the purpose of characterizing the groundwater conditions in the area, the geologic formations have been grouped into six hydrostratigraphic units. The general physical characteristics of these units are presented in **Table 3.4-3**.

Table 3.4-3 Summary of Hydrostratigraphic Unit Properties

Hydrostratigraphic Unit	Reported Yields (gpm)	Estimated Hydraulic Conductivity (feet per day)	Estimated Transmissivity (square feet per day)	Estimated Specific Yield (no units)
Younger Basin Fill	Up to 3,600 in Boulder Valley[2]	1 - 100[2]	4,500[1] - 13,400[2]	0.15 - 0.252[2]
Older Basin Fill	<100 - 1,000[1]	0.05 - 5[2]	20 - 14,000[2]	0.01 - 0.10[2]
Intrusive Rocks	Generally <100[2]	0.01 - 1[2]	NA	NA
Volcanic Rocks	Up to 5,800 in Boulder Valley[2]	0.5 - 200[2]	300 - 100,000[2]	0.0007 - 0.07[2]
Marine Clastic Rocks	10 - 600[2,3]	0.01 - 0.5[2]	30 - 800[2]	0.0001 - 0.004[2]
Marine Carbonate Rocks	500 - 5,000[2]	0.1 - 100[2]	13 - 300,000[2]	0.0002 - 0.03[2]

[1] Source: Maurer et al. 1996.
[2] Source: McDonald Morrissey Associates, Inc. (MMA) 1998, 1996a,b.
[3] Where highly fractured, may yield more than 600 gpm.
NA – No data available.

These six hydrostratigraphic units include two distinct types of materials: fractured rock (carbonate, siliceous, intrusive, volcanic, and bedrock), and unconsolidated to poorly consolidated sediments (alluvial and basin fill deposits). In the bedrock units, recharge, storage, flow, and discharge of groundwater primarily are controlled by the secondary features (i.e., fractures, faults, and solution cavities) that enhance the porosity and permeability of the rock. In the unconsolidated to poorly consolidated sediment, the groundwater is stored and transmitted through interconnected pores within the sediments.

Hydrogeologic Units

The six hydrostratigraphic units and their hydrogeologic characteristics are discussed below.

Marine Carbonate Rocks

The Paleozoic marine carbonate rocks consist of limestone and dolomite and lesser amounts of shale, sandstone, and quartzite that are part of the lower plate. These rocks are mainly Cambrian to Devonian in age but locally also include Pennsylvanian/Permian carbonate rocks. These rocks are part of the Carbonate Rock Aquifer Province, a major bedrock carbonate aquifer system that covers extensive areas in eastern Nevada (Prudic et al. 1995). Regional maps infer that the northwestern boundary of the Carbonate Rock Aquifer Province is located near the proposed project area (Prudic et al. 1995). Carbonate rocks appear at the surface in the Tuscarora Mountains south of the Betze-Post Pit and in bedrock outcrops in the Maggie Creek and Susie Creek basins. Carbonate rocks are believed to underlie the younger units and the marine clastic rocks (beneath the Roberts Mountain Thrust) in areas within the carbonate rock province. In areas of carbonate rock outcrop, the overlying clastic rocks and younger volcanics are thought to have been removed by erosion (MMA 1996a).

The marine carbonate rocks have low primary permeability. However, where they are faulted or fractured coupled with dissolution, their transmissive properties greatly increase. Secondary permeability can raise the hydraulic conductivity of the marine carbonate rocks approximately 100 feet per day and result in a transmissivity as high as 300,000 square feet per day. The specific yield for these rocks ranges from 0.0002 to 0.03. Yields from wells range from 500 to as much as 5,000 gpm due to secondary permeability.

Marine Clastic Rocks

The Paleozoic marine clastic rocks consist of interbedded shale, siltstone, chert, quartzite, and limestone. Marine clastic rocks are believed to underlie the alluvium and volcanic rocks in most of the study area, and they form the upper plate of the Roberts Mountain Thrust. These clastic rocks are exposed in the Tuscarora Mountains, Independence Range, and Adobe Range (**Figure 3.3-2**). They have been extensively thrusted and eroded, and estimates of their thickness range from 50 to 5,000 feet. These rocks are fine-grained and have low hydraulic conductivity with most reported values ranging from 0.01 to 0.5 feet per day (MMA 1996a), but local faulting, fracturing, and solution widening can increase secondary permeability (Maurer et al. 1996). Transmissivity ranges from 30 to 800 square feet per day, and the specific yield ranges from 0.0001 to 0.004. Well yields are low and in the range of 10 to 600 gpm.

Intrusive Rocks

Tertiary through Jurassic intrusive rocks are a minor component of the rock types in the study area and consist mostly of granodiorite, quartz monzonite, monzonite, and diorite. The intrusive rocks tend to form relatively impermeable boundaries or impediments to groundwater flow. Reasonable estimates of hydraulic conductivity are 0.01 to 1 feet per day, and wells generally yield less than 10 gpm (MMA 1996a). Wells completed in the intrusive rocks may yield small quantities of water near some faults (Maurer et al. 1996).

Volcanic Rocks

The volcanic rocks consist of Tertiary through Jurassic aged rocks that include a wide range of igneous rock types: rhyolitic to basaltic lava flows, welded and nonwelded ash-fall tuffs, flow breccia, and tuffaceous sedimentary rocks. The volcanics occur throughout the area with most of the exposures in the western, northern, and south-central portions of the CESA. This wide range of rock types results in highly variable hydraulic parameters. The welded tuff, basalt, and andesite generally have low transmissive properties, while the rhyolite, particularly where fractured, is more transmissive. Estimates of hydraulic conductivity range from 0.01 to 200 feet per day, with transmissivity ranging from 300 to as much as 100,000 square feet per day. The specific yield has been estimated to range from 0.0007 to 0.07 in the case of the Boulder Valley rhyolite. Yields to wells can be up to 5,800 gpm.

Older Basin-fill Deposits

The older basin fill deposits (including the Carlin Formation) are Pliocene to Miocene age and are primarily composed of poorly consolidated shale, claystone, mudstone, siltstone, sandstone, conglomerate, freshwater limestone, tuff and lava flow (Maurer et al. 1996; Plume 1995). These deposits accumulated in basins that developed in the earliest stages of extensional faulting. In the upper Maggie Creek basin, these deposits are estimated to be up to 6,000 feet thick. In Susie Creek and lower Maggie Creek basins, the deposits are generally less than 2,000 feet thick (Hydrologic Consultants, Inc. 1999). Wells completed in the Carlin Formation have reported yields ranging from less than 100 to 1,000 gpm. In the Maggie Creek area, hydraulic conductivity ranges from 1 to 7 feet per day and transmissivity from 780 to 9,800 square feet per day (Maurer et al. 1996). In the northern part of Boulder Flat, transmissivity is estimated to range from 70 to 300 square feet per day. Locally, the fine-grained beds act as an aquitard producing confined groundwater conditions in the underlying rocks (BLM 1991a). The estimated specific yield is in the range of 0.01 to 0.10.

Younger Basin-fill Deposits

The Quaternary alluvium contains a wide range of materials: sandy clay, silty sand, gravelly sand, and sandy gravel. The thickness and lateral extent of this material also is highly variable. In higher elevation mountain areas, the alluvium occurs as discontinuous to continuous strands of unconsolidated material covering or partially covering bedrock along the floor of the valley or ravine. Alluvium in higher elevation areas generally is less than a few tens of feet thick. In broad basin areas, such as Boulder Flat, and to a lesser extent in the Maggie Creek and Susie Creek basins, the alluvium occurs as sequences of unconsolidated to poorly consolidated material up to 1,000 feet thick (MMA 1996a). Overall, the alluvium is generally coarser-grained in the mountains and finer-grained in the basins, and it becomes finer toward the center of the basin. The alluvium also is characterized by significant lateral and vertical stratigraphic variation with clay typically occurring as thinly bedded lenses. The alluvium generally is presumed to be an unconfined aquifer; however, semi-confined conditions may exist locally where less permeable fine-grained units inhibit vertical flow. Well yields can range up to 3,600 gpm in Boulder Valley, with hydraulic conductivities ranging from 1 to 100 feet per day, transmissivity ranging from 4,500 to 13,400 square feet per day, and a specific yield estimated to range from 0.15 to 0.25.

<u>Hydrostructural Units</u>

Faults can serve as pathways for groundwater flow or act as barriers to flow, depending on the nature of the brecciation along the fault and the permeability of units juxtaposed by the faulting. Fractures, bedding planes, and cavities in bedrock units often allow for local flow of groundwater and create increased permeability over a defined area. Long-term monitoring of water level changes in the vicinity of the BGMI facility has resulted in the recognition of three major fault zones that impede groundwater flow across the fault zone: Boulder Narrows Fault, Siphon Fault, and Post Fault. Other faults with the potential to influence groundwater flow and groundwater dewatering are the Little Boulder Basin Fault, the Tuscarora Fault on the east side of the Tuscarora Mountains, and the Gold Quarry Fault. The influence of these structures on the groundwater flow system generally is characterized by a noticeable change in gradient and water levels on either side of the faults. These hydrostructural features are described in the Betze Project, Draft Supplemental EIS (BLM 2000c) and Betze Pit Expansion Project, Draft Supplemental EIS (BLM 2008b).

<u>Groundwater Levels</u>

BGMI has monitored water levels in the regional aquifer system in the Boulder Valley, Rock Creek, and Willow Creek hydrographic basins since 1991 as a condition of their water rights permits. This monitoring system includes several wells located within and near the vicinity of the proposed project area (**Figure 3.4-4**). The water level contours indicate that the regional groundwater elevations range from approximately 5,200 feet at the northeastern corner to approximately 3,576 feet in the southeastern portion of the proposed project area. The water level contours also infer that hydraulic gradient for the regional groundwater aquifer system slopes steeply from north to south in the northern portion of the proposed project area, and west to east along the western portion of the proposed project area. In contrast, the water level elevations in the southeastern portion of the proposed project area are essentially flat and equivalent to the water levels at the Betze-Post Pit located approximately 3.9 miles south of the proposed project boundary.

Figure 3.4-5 shows the change in groundwater elevation (i.e., drawdown) since dewatering at the BGMI facility was initiated in 1990. Mine dewatering for the Betze Pit was initiated in 1990 and continued through 2010. The target dewatering elevation for the Betze/Post Pit of 3,576 feet amsl was reached in 2000 (John Shomaker & Associates, Inc. [JSA] 2010a). Since that time, the mine dewatering operations have continued to maintain water levels at the approximate 3,576 elevation. Mine dewatering activities at the BGMI facility have resulted in lowering the groundwater levels approximately 1,700 feet within an approximately 2.5-mile-wide northwest-trending zone that extends from the Betze-Post Pit to near the center of the proposed project area. Groundwater pumping for mine dewatering at the BGMI facility is

projected to continue until the end of 2021, and additional pumping for mine reclamation and mine processing activities would continue through 2034 (JSA 2010b).

Water Quality Standards

Waters of the State of Nevada are defined in Nevada Revised Statutes Chapter 445, Section 445.191 and include, but are not limited to: 1) all streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems, and drainage systems; and 2) all bodies of accumulations of water, surface and underground, natural or artificial.

Water quality standards for state waters have been established by the State of Nevada under Nevada Administrative Code (NAC) 445A.117 through 445A.128. NAC 445A.453 establishes primary water quality standards, and NAC 445A.455 establishes secondary standards for water quality. General Nevada water quality standards are summarized in **Table 3.4-4**. Primary standards are based on the potential use of groundwater for drinking water and are established to protect human health; the secondary standards are for aesthetic qualities. These standards also are referred to as Maximum Contaminant Levels (MCLs). Because groundwater downgradient of the project has the potential to be used for drinking water, the Nevada drinking water standards would apply to mine-related activities that affect groundwater (NAC 445.424).

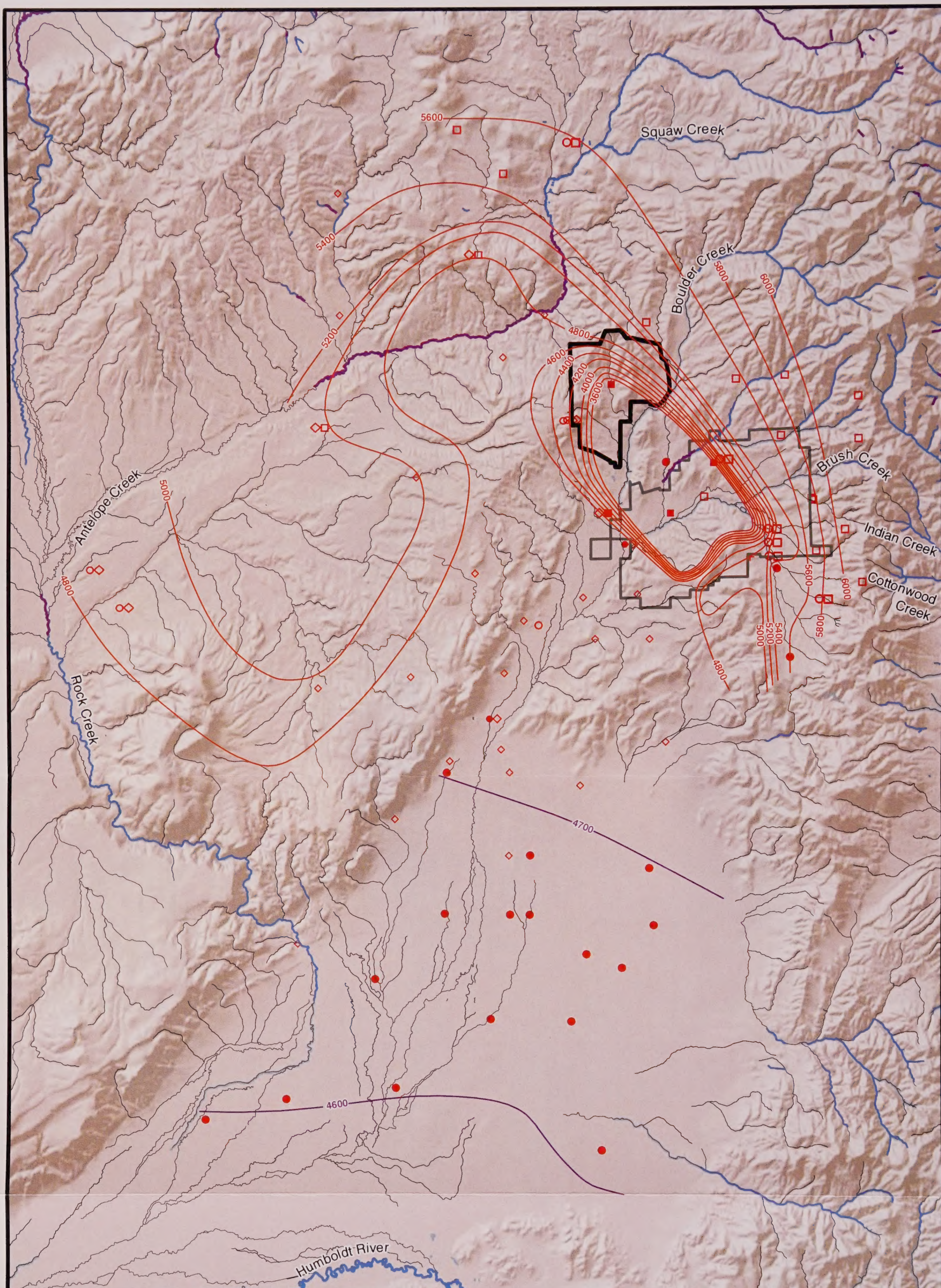
Surface water quality standards indicated in **Table 3.4-5** represent more specific values for streams designated as Class C waters by the state of Nevada. Designated Class C surface waters, such as Rock Creek, have stream standards identified by the state in NAC 445A.121 and 122, NAC 445A.126, and NAC 445A.144. Because of the questionable drainage continuity in lower Boulder Flat, it is currently unknown if Class C standards apply to Boulder Creek and its tributaries within the project area. The standards indicated in **Table 3.4-5** are included simply for reference and as a basis for discussion.

Surface Water Quality

Surface water sampling has been conducted in the proposed project area since the second quarter of 2008 (SRK 2010b), and on Boulder Creek at Sites BC-AA and BC-A nearby since March 1993 (BGMI 2010; BDMV 2010e). On-site sampling efforts were conducted at seep, spring, and pond sites shown in **Figure 3.4-2**. Sampling results are summarized in **Table 3.4-5**. Based in **Table 3.4-5,** most of the water quality constituents analyzed in the samples have levels within the reference Class C water quality standards.

The surface water quality results (Table 3.4-5) reflect standard USEPA analytical methods and the NDEP Profiles I and II orientation required for the state Water Pollution Control Permit and subsequent monitoring programs for mining projects. The analyses were conducted by an NDEP-approved analytical laboratory (SVL Analytical of Kellogg, Idaho). The Method Reporting Limits (MRLs), as indicated by the "less-than" symbol (<) in Table 3.4-5, relate to the NDEP Profile I and Profile II reference values. While some MRLs presented on Table 3.4-5 may be greater than the most stringent Class C stream standard, they are well within the NDEP Profile I and II reference values, which form the monitoring basis for the NDEP Water Pollution Control Permit and BLM NEPA analysis according to interagency agreements. NDEP Profile I and II reference values are currently the Nevada Drinking Water Standards indicated in Table 3.4-4.

Monitoring records indicate that at most of the sites, for most of the time, sufficient free water did not exist to allow sample retrieval (SRK 2010b). Due to moisture conditions, samples were intermittently obtained at Sites AR05, AR17, AR27, and AR34. At Sites AR09 and AR36 (**Table 3.4-5** and **Figure 3.4-2**) samples consistently were retrieved and analyzed.



Legend
- Proposed PoO Boundary
- Goldstrike Mine Operations Boundary
- Monitoring Well Quaternary Alluvium/Colluvium Layer
- Monitoring Well Tertiary Carlin Formation Layer
- Monitoring Well Tertiary Volcanics Layer
- Monitoring Well Jurassic/Cretaceous Granodiorite Layer
- Monitoring Well Paleozoic Siltstones Layer
- Monitoring Well Paleozoic Limestones Layer
- Perennial Stream Reach
- Intermittent or Ephemeral Stream Reach
- Discontinuous Flowing Stream Reach (interrupted flow that stops and starts)
- Tertiary and Paleozoic Rock Potentiometric Surface Elevation
- Boulder Valley Alluvium Potentiometric Surface Elevation

N

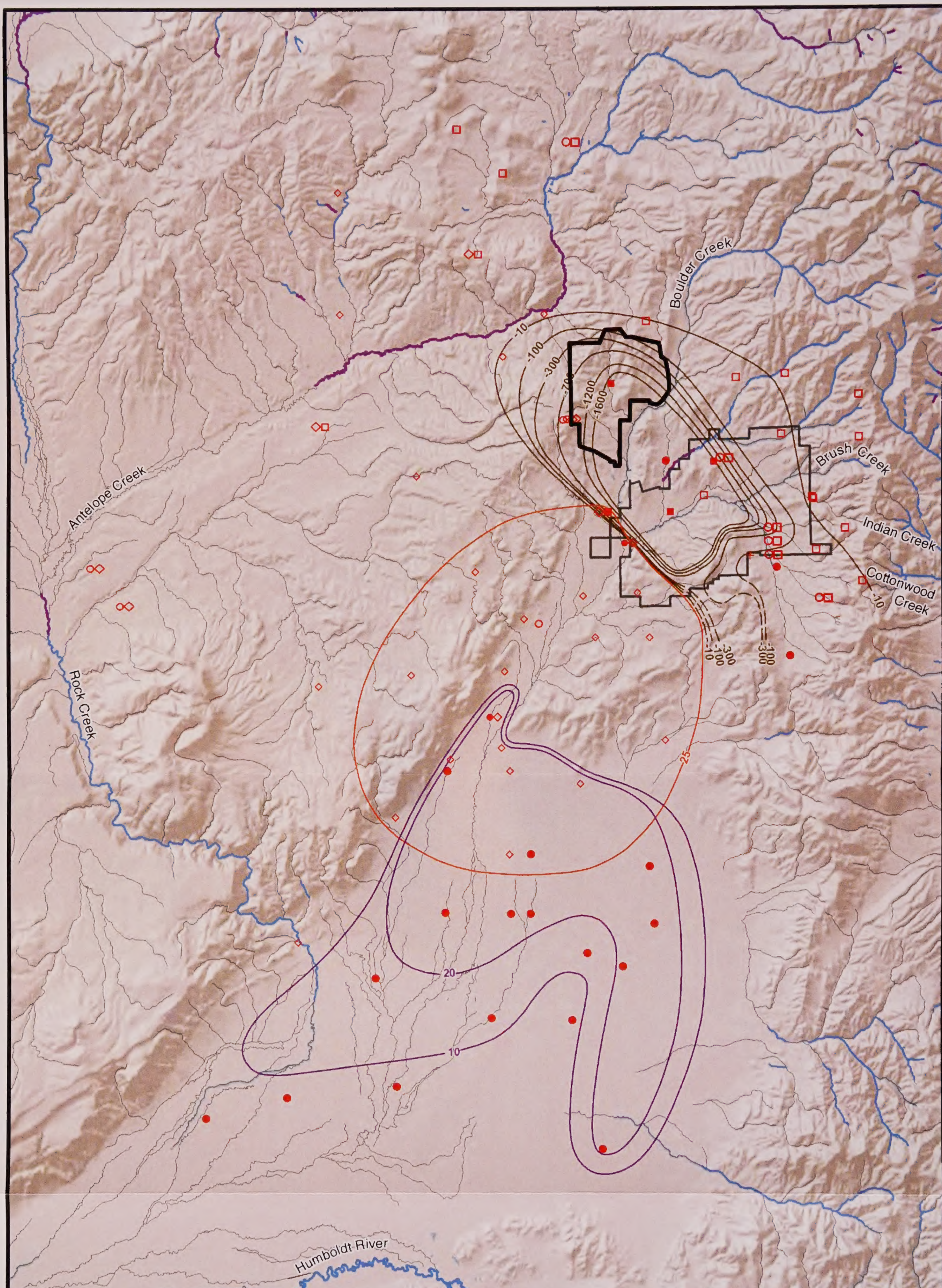
0 1 2 Miles

Source: BGMI 2010.

Arturo Mine Project EIS

Figure 3.4-4
Regional Groundwater Elevation
(First Quarter 2010)

05/25/2012



Legend

- Proposed PoO Boundary
- Goldstrike Mine Operations Boundary
- Monitoring Well Quaternary Alluvium/Colluvium Layer
- Monitoring Well Tertiary Carlin Formation Layer
- Monitoring Well Tertiary Volcanics Layer
- Monitoring Well Jurassic/Cretaceous Granodiorite Layer
- Monitoring Well Paleozoic Siltstones Layer
- Monitoring Well Paleozoic Limestones Layer
- Perennial Stream Reach
- Intermittent or Ephemeral Stream Reach
- Discontinuous Flowing Stream Reach (interrupted flow that stops and starts)
- Water Level Change in Tertiary Volcanics
- Water Level Change in Uppermost Bedrock Due to Pumping
- Water Level Change in Quaternary Alluvium/Colluvium

N

0 1 2 Miles

Source: BGMI 2010.

Arturo Mine Project EIS

Figure 3.4-5
Changes in Regional Groundwater Elevation (1990 - 2010)

05/24/2012

Table 3.4-4 General Nevada Water Quality Standards

Constituent (mg/l)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	Secondary MCL[2]		Irrigation	Livestock Watering	
Physical Properties						
Dissolved Oxygen	--	--	Aerobic	--	Aerobic	5.0
Color (color units)	--	15[3]	75	--	--	--
Total Dissolved Solids (TDS) (at 180°C)	--	500[4]; 1,000[3]	500[4]; 1,000[3]	--	3,000	--
Turbidity (NTU)	--	--	--	--	--	--
Inorganic Nonmetals						
Ammonia (unionized) (Total NH_3 as N)	--	--	0.5	--	--	--
Chloride	--	250[4]; 400[3]	250[4]; 400[3]	--	1,500	--
Cyanide (as CN)	0.2	--	0.2	--	--	--
Fluoride	4.0	2.0[4]	--	1.0	2.0	0.0052[5]
Nitrate (as N)	10	--	10	--	100	--
Nitrite (as N)	1.0	--	1.0	--	10	--
pH (standard units)	--	6.5-8.5[3]	5.0-9.0	4.5-9.0	6.5-9.0	6.5-9.0
Sulfate	--	250[4]; 500[3]	250[4]; 500[3]	--	--	--
Metals[6]/Elements						
Aluminum	--	0.05[3]-0.2[4]	---	--	--	--
Antimony	0.006	--	0.006	--	--	--
Arsenic (total)	0.01	--	0.01	0.10	0.20	0.18[5,7]
Barium	2.0	--	2.0	--	--	--
Beryllium	0.004	--	--	0.10	--	--
Boron	--	--	--	0.75	5.0	--
Cadmium	0.005	--	0.005	0.01	0.05	0.0006[5,8]
Chromium (total)	0.1	--	0.1	0.10	1.0	0.015[5,8]
Copper	1.3[9]	1.0[3]	--	0.20	0.50	0.0065[5,8]
Iron	--	0.3[4]; 0.6[3]	--	5.0	--	1.0
Lead	0.015[9]	--	0.05	5.0	0.10	0.0004[5,8]
Magnesium	--	125[4]; 150[3]	--	--	--	--
Manganese	--	0.05[4]; 0.1[3]	--	0.2	--	--
Mercury	0.002	--	0.002	--	0.01	0.00012[5]

Table 3.4-4 General Nevada Water Quality Standards

Constituent (mg/l)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	Secondary MCL[2]		Irrigation	Livestock Watering	
Nickel	0.1	--	0.134	0.20	--	0.087[5,8]
Selenium	0.05	--	0.05	0.02	0.05	0.005[5]
Silver	--	0.1[3]	--	--	--	0.0014[5,8]
Thallium	0.002	--	0.013	--	--	--
Zinc	--	5.0[4]	--	2.0	25	0.584[5,8]

1 Units are milligrams per liter (mg/l) unless otherwise noted.

2 MCL = Maximum contaminant level. Federal primary standards that existed as of July 1, 2009, are incorporated by reference in NAC 445A.4525.

3 Nevada secondary MCLs.

4 Federal secondary MCLs.

5 96-hour average.

6 The standards for metals **and metalloids** are expressed as total recoverable unless otherwise noted.

7 Standard for arsenic (III); trivalent (reduced) inorganic form of arsenic, which occurs as a water soluble form.

8 Standard is dependent on site-specific hardness; displayed value is based on a hardness of 60 mg/l as calcium carbonate. (See NAC 445A.144 for equations.)

9 Value is action level for treatment technique for lead and copper.

Sources: 40 Code of Federal Regulations (CFR) 141.51; 40 CFR 143.3; NAC 445A.119, 445A.144, 445A.453, and 445A.455.

TDS concentrations were outside the Class C stream standards at Site AR09. This site is located at the toe of the existing WRDF, on the upgradient side of where water flows into a constructed pond. Investigators indicate it is likely that water at Site AR09 is partially from meteoric sources and also from a previously-existing water source, as indicated by the observed perennial flow (SRK 2010b). Cedar Creek (2009) suggests the water at Site AR09 is spring flow or mine drainage.

The occurrence of low levels of weak acid dissociable (WAD) cyanide in water chemistry at AR-09 may suggest a historical process source for some of the seepage. However, the WAD cyanide concentrations are low (geometric mean of 0.029 mg/l; arithmetic mean of 0.033 mg/l), and well within NDEP Profile I and II reference values. In addition, no WAD cyanide concentrations were reported for samples analyzed at AR-36 or AR-05 immediately downgradient.

TDS concentrations were outside the Class C Stream standards at Site AR17. This sampling location is above the Carlin Formation, and also is in a drainage bottom at the toe of the existing WRDF (Cedar Creek 2009; SRK 2010b). Free water or moist soil was observed at Site AR17 during each sampling event. The elevated TDS concentrations at this location may be due to the generally stagnant conditions.

TDS concentrations and pH were outside the Class C Stream standards at Site AR36. This location is next to the earthen dam on the opposite (downgradient) side of the 2-acre detention pond from Site AR09. ***The TDS concentrations at AR-36 are somewhat less than those at AR-09; conditions at AR-36 are affected by seasonal runoff. Rather than evapoconcentration, the higher pH values at AR-36 are likely due to algal accumulations, which remove aqueous CO_2. A corresponding decline in calcium and total alkalinity is reflected in the data. Substantial algae growth at the BLM***

pond is evident in historical aerial photography, and the elevated pH values do not occur downstream.

Off-site water quality data are available for Boulder Creek and Antelope Creek as indicated in **Table 3.4-5**. For pH and TDS, ***historical*** sampling data from the BVMP ***during the time of active mining in the area*** indicate that constituent concentrations in Boulder Creek upgradient and downgradient of the project area were well within the reference Class C receiving water quality standards (BGMI 2010). Site BC-AA is located on Boulder Creek immediately upgradient of the ephemeral channel on which Site AR17 is located (**Figures 3.4-2 *and 3.4-3***). Water quality from BC-AA for these constituents was well within the reference Class C water quality standards during the same sampling period as the project baseline samples.

BVMP Site BC-A is located on Boulder Creek approximately 2.5 miles downgradient of the project area. Similar to the upstream data, the water quality at Site BC-A was well within the reference Class C water quality standards during the same sampling period as the project baseline samples. On upper Antelope Creek, water quality from Site ANT-1 was well within the reference Class C water quality standards for the constituents of interest. This site is upgradient of any potential project effects, and indicates that background water quality is within reference stream standards.

Data from these sites on Boulder and Antelope creeks indicate that, although TDS and/or pH levels were elevated in the project area, off-site conditions for these constituents were not elevated above the reference Class C water quality standards. On-site baseline exceedences at AR09, AR17, and AR36 do not appear to have generated concentrations above the Class C reference values in Boulder Creek. This may result from a combination of factors, including the impounded nature of the AR09 and AR36 locations, limited flow durations in the project-area tributaries, seepage into channel beds, and dilution from other tributaries to Boulder Creek.

<u>Groundwater Quality</u>

Groundwater quality in the region is based on sampling conducted for the original Betze Project EIS (BLM 1991a,b) and from 61 wells sampled as part of the Betze-Screamer Pit Lake Study (Radian International and Baker Consultants 1997). In addition, 36 regional wells were selected to characterize the groundwater in the Boulder Valley alluvium and Tertiary volcanics (BLM 2000b,c). The Betze Pit Expansion Project, Draft Supplemental EIS Appendix B, (BLM 2008b) presents the general groundwater chemistry for the major hydrostratigraphic units in the region.

There are three main hydrostratigraphic units that occur within the proposed project area and are exposed in the existing open pit and that would be exposed in the proposed pit expansion: 1) marine carbonate rocks; 2) marine clastic rocks; and 3) older basin fill deposits (i.e., Carlin Formation). The marine carbonate rocks contain a strong calcium-bicarbonate water type that is relatively low in sodium and sulfate; average TDS are approximately 566 mg/l, and average pH is around 6.7 standard units. The marine clastic rocks in the region primarily contain calcium-magnesium-bicarbonate water with elevated sulfate and silica. The average TDS in this water are approximately 305 mg/l, and pH is approximately 7.6 standard units. The older basin fill contains a calcium-bicarbonate water with silica and sulfate; average TDS are approximately 478 mg/l, and average pH is approximately 7.4 standard units.

3.4.1.4 Rock Geochemistry

Mining operations bring mineralized rocks from depth, where they are geochemically stable, to the surface, where they are exposed to air and water and are subject to weathering reactions. Sulfide minerals, in particular, undergo oxidation reactions resulting in acid sulfate and metal-bearing solutions that could potentially affect surface and groundwater resources. The potential of mined rock to affect contact water within the proposed project area is assessed in two principal ways: by determining acid rock drainage risk and metal leaching risk (***Schafer 2013***).

A series of standard geochemical tests were conducted with rock material from the proposed open-pit mine expansion area, the future and existing mine pit surface areas, and existing WRDF to evaluate the potential for future releases of metals and other solutes. These tests include acid-base accounting, static testing, net-acid generation (NAG), pH tests, kinetic testing (humidity cells), and meteoric water mobility procedures (MWMP). Two hundred twenty-five waste rock samples were tested. **Table 3.4-6** shows the number of samples per each waste rock type.

Waste Rock Characterization

The proposed project would generate approximately 600 million tons of waste rock material that would be placed in the West WRDF and East WRDF. The waste rock material generated during mining consists of the following:

- Carlin Formation (***38.0*** percent of the projected waste rock tonnage), which is composed of unmineralized silt and clay. It has no potential for acid generation.
- Vinini Formation (***39.3*** percent of the waste rock tonnage), which consists of interbedded siltstones and cherts. The Vinini is generally oxidized throughout the proposed project area. Vinini rocks are siliceous, have a low acid neutralizing potential (ANP), and have variable but generally low levels of sulfide sulfur. A small fraction of Vinini rocks may have the ability to form acidic conditions upon weathering, and silicic portions of the Vinini may release metals at neutral pH levels.
- Rodeo Creek Unit (***15.2*** percent of the waste rock tonnage), which is a siltstone containing approximately 8 percent carbonate minerals. Approximately 44 percent of the Rodeo Creek unit materials are oxidized and 56 percent are unoxidized. The abundance of sulfur varies according to the oxidation status. Oxidized rock generally has no detectable sulfide sulfur (except rarely near transition zones). Unoxidized rock averaged 0.9 percent total sulfur in available test work, but only a minority of these samples (9 of 23, or 39 percent) (***Schafer 2013***) had more acid generation potential (AGP) than ANP. Overall, sulfide-containing Rodeo Creek material comprises approximately 11 percent of the waste rock. Approximately 25 percent of the sulfide Rodeo Creek unit is acid-generating, while 75 percent is expected to remain neutral (***Schafer 2013***).
- Bootstrap limestone (***2.0*** percent of waste rock). Based on the analytical results, approximately ***44*** percent of the Bootstrap limestone material contains sulfide; however, the calcite in the limestone makes acid generation unlikely.

Acid-base Accounting Tests

Acid-base accounting (static testing) is based on determinations of the AGP, which is a function of the amount of sulfide minerals in a rock, and the ANP, which is a function of the amount of carbonate minerals in a rock. The ANP and AGP are expressed in terms of kilograms of calcium carbonate per ton of sample (kg/t). The difference between the ANP and AGP is the net-neutralizing potential (NNP).

For purposes of assessing acid rock drainage risk, rocks within the proposed project area were assumed to be potentially acid generating (PAG) if the NNP was less than 0, and pyritic sulfur exceeded 0.1 percent. Sulfide values below 0.1 percent rarely result in acid generation (***Schafer 2013***). Fifteen of the 225 samples tested were PAG according to the above criteria. (**Table 3.4-6**).

Table 3.4-5 Water Quality Summary for Sampled Surface Drainage Locations within and near the Project Area[1]

Constituent [2]	Stream Standard Reference[3]	Site AR05	Site AR09	Site AR17	Site AR27	Site AR34	Site AR36	Site BC-AA	Site BC-A	*Site ANT-1*	*Site ANT-2*
Aluminum		<0.080	<0.080	<0.080	3.39	1.58	<0.080 – 0.14	0.85 – 0.859	0.727 – 3.89	*2.96*	*<0.08*
Antimony		0.00572	0.0149 – 0.0229	0.0196 -0.0286	<0.00300	<0.00300	0.0136	<0.003	<0.003	*<0.003*	*<0.003*
Arsenic	0.1 (I)	0.0241	0.0508 – 0.0805	0.0178 – 0.0728	<0.00300	<0.00300	0.0595 – 0.0763	<0.003	0.00396 – 0.00418	*<0.003*	*0.00583*
Barium		0.0116	0.0421 – 0.105	0.175 – 0.83	0.0674	0.0841	0.0083 – 0.0981	0.0765 – 0.126	0.1990 – 0.346	*0.0637*	*0.0958*
Beryllium	0.1 (I)	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.002	<0.002	*<0.002*	*<0.002*
Boron	0.75 (I)	0.27	0.198 – 0.283	0.119 – 0.144	<0.074	0.09	0.297 – 0.375	<0.04 – 0.041	<0.04 – 0.04	*0.056*	*0.176*
Cadmium[4]	0.0006 (A)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.002	<0.002	*<0.002*	*<0.002*
Chloride		85	80.8 – 136	48.8 – 79.3	2.27	5.65	142 – 156	2.45 – 3.54	3.68 – 3.86	*8.66*	*21.7*
Chromium (total)	0.1 (I)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.006	<0.006	*<0.006*	*<0.006*
Copper[4]	0.0065 (A)	<0.010	<0.010 – 0.011	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01 – 0.01	*<0.01*	*<0.01*
Fluoride	1 (I)	0.891	0.829 – **1.13**	0.712 – 0.822	0.159	0.139	0.831 – 0.974	0.131 – 0.158	0.186	*0.268*	*0.321*
Iron[4]	1 (A)	<0.060	<0.060	<0.060	**2.03**	0.857	<0.060 – 0.097	0.453 – 0.512	0.458 – 2.78	*1.8*	*<0.06*
Lead[4]	0.0004 (A)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.003	<0.003	*<0.003*	*<0.003*
Manganese	0.2 (I)	0.138	<0.0040 – 0.0197	0.0045 – 0.0158	0.0196	0.0102	<0.0040 – 0.0051	0.0134 – 0.016	0.008 – 0.101	*0.0495*	*0.188*
Mercury[4]	0.00077 (A)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0002	<0.0002	*<0.0002*	*<0.0002*
Nickel[4]	0.087 (A)	<0.010	<0.010 – 0.0221	<0.010	<0.010	<0.010	<0.010	0.01	<0.01	*<0.01*	*<0.01*
Nitrate + Nitrite, Total (as N)		1.38	15.0 – 38.6	14.7 – 42.7	0.0789	0.0996	0.32 – 8.08	<0.02 – <0.25	<0.05 – <0.25	*0.117*	*0.0538*
pH (S.U.)	6.5 – 9.0	8.18	8.09 – *8.52*	8.07 – 8.74	7.45	7.62	**9.03 – 9.67**	7.95 – 8.13	7.81 – 8.1	*7.76*	***9.04***
Selenium[4]	0.005 (A)	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.003	<0.003	*<0.003*	*<0.003*
Silver		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.005	<0.005	*<0.005*	*<0.005*
Sulfate		157	139 – 186	59.6 – 80.6	9.92	17.8	239 – 262	16.2 – 22.2	181.1 – 31.5	*25.3*	*150*
Thallium		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.001	<0.001	*<0.001*	*<0.001*
Total Dissolved Solids	≤500 milligrams per liter (mg/l) or 1/3 above that characteristic of natural conditions (whichever is less)	**580**	**560 – 961**	**510 – 650**	182	195	**747 – 862**	151 – 160	136 – 167	*178*	*394*
WAD Cyanide		<0.0100	0.0198 – 0.0702	no data	no data	no data	<0.0100				
Zinc[4]	0.584 (A)	<0.0100	<0.0100	<0.0100	0.0105	<0.0100	<0.0100	<0.01	<0.01 – 0.0331	*0.0236*	*<0.01*

[1] Where more than one sample was analyzed, the range of results is indicated. *The less than symbol (<) indicates the laboratory method reporting limits (MRL) as discussed in the text.*

[2] Units are milligrams per liter unless otherwise indicated. *Values for metals and metalloids are total recoverable concentrations.* Bold values exceed reference standards.

[3] For reference only. Indicates the most stringent Class C surface water standard for either irrigation (I), livestock watering (L), or aquatic life (A) in milligrams per liter. The *intermittent and* ephemeral reaches of Boulder Creek are not used for municipal/domestic supply. Standards for metals are expressed as total recoverable.

[4] 96-hour average; some are hardness based, where displayed value assumes a hardness of 60 mg/l as $CaCO_3$. Actual hardness (and the resulting stream standard) may differ.

Source: BGMI 2010; SRK 2010b.

Table 3.4-6 Acid-based Accounting Test Results Summary for Waste Rock to be Placed in the WRDFs

Rock Type	Number of Samples	NNP (kg/t)	AGP (kg/t)	ANP (kg/t)	ANP/AGP Ratio	NAG/pH (s.u.)[1]	Paste pH (s.u.)	PAG (%)
Carlin Formation	19	6.7	0.3	7.1	24	7.4	7.8	0
Vinini Formation	102	40.9	1.0	42.0	42	6.6	8.2	3.9
Bootstrap Oxide	13	560.8	0.7	561.5	802	8.0	8.2	0
Bootstrap Sulfide	17	869.8	0.3	870.1	2,900	8.1	8.6	0
Rodeo Creek Oxide	27	140.7	2.6	143.3	55	7.4	8.2	0
Rodeo Creek Sulfide	47	96.2	24.4	120.6	5	6.5	7.7	23.4
Expansion Area (average value)		**154.2**	**6.0**	**160.2**	**27**	**6.9**	**8.1**	***3.5***[2]

[1] s.u. - standard unit

[2] ***Overall percentage of PAG based on abundance of each rock type from block modeling multiplied by proportion of PAG from acid-base accounting tests (Schafer 2013).***

Source: Schafer 2011a; ***SRK 2012***.

The ratio of ANP to AGP can also be used to access the acid generation potential. If the ratio of the neutralization potential is 1:1(or less), the material is more likely to generate acid; whereas, if the ratio is 3:1 (or greater), the material is unlikely to generate acid (U.S. Environmental Protection Agency [USEPA] 1994). The average ANP/AGP ratio for all of the rock units tested ranged from 5:1 to 2,900:1. The average ANP of all samples tested was 160.2 kg/t, while the average AGP was 6.0 kg/t, for an average NNP of 154.2 kg/t **(Table 3.4-6b)** and an ANP/AGP ratio of approximately 27:1 (***Schafer 2013***).

The NAG pH testing consists of the addition of hydrogen peroxide, a strong oxidant, to a sample to accelerate the reaction of sulfides. If the acidity liberated through sulfide oxidation is not neutralized, the resultant acidic pH indicates a PAG sample. Twenty of the 225 NAG pH tests were PAG, including 15 of 47 Rodeo Creek sulfide samples and 5 of 102 Vinini samples. NAG test results are shown in **Table 3.4-6**.

<u>Kinetic Testing</u>

Kinetic testing, consisting of humidity cell testing, is designed to represent maximum rates of acid generation and metals released from rocks caused by intense weathering. The information obtained from these tests is used in geochemical modeling to represent the rate of solute release from pit rock into pit lakes and to evaluate waste rock for disposal alternatives.

Humidity cell tests were conducted for 52 weeks on six samples that varied in NNP from -31 to +943 kg/t. Samples tested in humidity cells represented rocks most likely to react and form acid, being selected mostly from unoxidized (sulfide) zones that had elevated pyritic sulfur levels. ***The samples selected for testing included three samples of the Rodeo Creek unit; two samples of Vinini Formation, and one sample of the Bootstrap limestone. One*** of the six samples ***(sample 3, Rodeo Creek sulfide)*** became strongly acidic over the period of testing. Acid generation was accompanied by high concentrations of trace metals. The samples that did not become acidic showed low concentrations of trace metals ***(Schafer 2013)***.

Table 3.4-6b 52-Week Humidity Cell Test Results

Humidity Cell	*Rock Type*	*NNP*	*NAG pH*	*Average pH Last 5 weeks*	*Net Alkalinity Last 5 weeks*
1	*Rodeo Creek sulfide*	*50.3*	*7.8*	*6.89*	*9.42*
2	*Bootstrap sulfide*	*943*	*8.2*	*7.70*	*12.79*
3	*Rodeo Creek sulfide*	*-31.5*	*2.5*	*2.14*	*-785.55*
4	*Rodeo Creek sulfide*	*-30.7*	*2.7*	*6.15*	*2.39*
5	*Vinni Formation*	*5.1*	*4.4*	*6.02*	*-0.48*
6	*Vinni Formation*	*5.4*	*5.2*	*5.97*	*0.90*

Source: Schafer 2013.

Constituent mobility potential tests were conducted on Carlin and Vinni Formation materials to assess the potential mobility from the solids by contact with meteoric water (McClelland Laboratories, Inc. 2010). These tests were conducted for a duration of 10 weeks in 7-day cycles. In brief, the testing method consisted of placing composites of crushed rock material (~3/8 inch or less) in columns and applying deionized water to the top of the column at a constant rate for 5 days and then allowing the column to free drain for 2 days. Each week, the pH, EC, and acidity and alkalinity of effluent was analyzed. The effluent collected at the end of weeks 2, 4, 6, 8, and 10 were submitted for laboratory analysis to evaluate the pH and release of metals within the effluent. The results indicate that the pH of the effluent over the 10 week duration of the test was neutral ranging from pH 7.44 to 8.31. These tests indicate that the composite samples of Carlin and Vinini Formation materials did not generate acid or release elevated concentrations of metals.

Meteoric Water Mobility Procedure Testing

MWMP testing simulates conditions under which infiltrating precipitation (rainwater and snowmelt) may leach constituents present in the waste rock. MWMP tests were conducted on 89 samples, including 40 samples of Rodeo Creek (24 sulfide), 14 samples of Bootstrap (6 sulfide), 33 samples of Vinini, and 2 samples of Carlin. The vast majority of project samples would be expected to have solution with high pH and low metals, but a small fraction of the higher sulfide Rodeo Creek samples may develop low to moderate pH and moderate to high metals (***Schafer 2013***).

The MWMP tests also reflected the typical Carlin Trend geochemical signature of elevated arsenic, antimony, and mercury with alkaline samples ranging from 0.002 to 0.2 mg/l soluble arsenic and antimony. Antimony levels generally were equal to arsenic, which is uncommon. More commonly, arsenic is more abundant in solution than antimony by a factor of 3 to 10. Most samples had no detectable mercury (<0.0002 mg/l), but a few Rodeo Creek samples had mercury from 0.001 to 0.008 mg/l.

In addition to information presented for numerous samples in Appendix A of the PoO, MWMP constituent analyses are available from the project area for representative material samples from the Carlin Formation, the Vinini Formation, Rodeo Creek waste rock materials, and surface soils (McClelland Laboratories 2010). These sample results are summarized in **Table 3.4-7**

Table 3.4-7 Meteoric Water Mobility Results for Representative Material Sources

Constituent [1]	Nevada Drinking Water Standards [2]	Carlin	Vinini	Rodeo Cr Sulfide, PAG [7]	Rodeo Cr Sulfide, Non-PAG	Rodeo Creek Oxide	Surface Soil
Aluminum	$0.05^4 – 0.2^5$	1.84	0.141	<0.080	<0.080	<0.080	0.297
Antimony	0.006	<0.0030	0.00492	1.67	0.0231	0.00421	<0.0030
Arsenic	0.01	0.00806	0.0138	0.0243	0.0151	0.00569	0.0268
Barium	2.0	0.0998	0.0814	0.0183	0.0508	0.0333	0.106
Beryllium	--	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron	--	0.079	0.111	0.167	0.087	0.153	0.207
Cadmium	0.005	<0.0020	<0.0020	0.0026	<0.0020	<0.0020	<0.0020
Calcium	--	19.4	28.6	371	67.6	109	42.7
Chloride	250^3, 400^4	--	--	--	--	--	--
Chromium (total)	0.1	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper	1.3^6, 1.0^5	<0.010	0.011	<0.010	<0.010	<0.010	<0.010
Fluoride	2.0^4, 4.0^5	--	--	--	--	--	--
Iron	0.3^4, 0.6^5	0.683	<0.060	<0.060	<0.060	<0.060	0.111
Lead	0.015^6	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Magnesium	125^4, 150^5	3.74	6.94	39.2	38.6	43.2	10.6
Manganese	0.05^4, 0.1^5	0.0178	0.0114	4.25	0.0419	0.0231	<0.0040
Mercury	0.002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	--	0.0252	0.0662	0.784	1.26	0.204	0.0221
Nickel	0.1	<0.010	<0.010	0.286	0.014	<0.010	<0.010
Nitrate N	10	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
pH, Extraction Fluid	--	5.61	5.61	5.61	5.61	5.61	5.61
pH, Leachate	$6.5 – 8.5^3$	8.00	8.09	7.74	8.26	8.03	8.17
Potassium	--	--	--	--	--	--	--
Selenium	0.05	<0.0030	0.0221	0.240	0.143	0.0266	0.00488
Silver	0.1^5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	--	37.4	20.4	11.1	35.5	46.1	103
Thallium	0.002	<0.0010	<0.0010	0.00206	<0.0010	<0.0010	<0.0010
TDS	500^4, $1{,}000^5$	230	190	1700	580	800	520
Vanadium	--	0.0091	0.0079	<0.0050	0.0063	<0.0050	0.0359
Zinc	5.0^5	<0.010	<0.010	0.0933	<0.010	<0.010	<0.010

[1] Values in milligrams per liter, except for pH in standard units.
[2] Nevada primary MCLs unless otherwise noted.
[3] Source: Appendix B, BLM 2008b.
[4] Federal secondary MCLs.
[5] Nevada secondary MCLs.
[6] Value is action level for treatment technique for lead and copper.
[7] Potentially Acid Generating

Source: McCelland Laboratories, Inc. 2010.

As reported in **Table 3.4-7**, many of the MWMP analyses for constituents of interest have concentrations below their reporting limits. These constituents include beryllium, cadmium, chromium, most copper analyses, lead, mercury, silver, and most thallium and zinc results. Thallium results in the Rodeo Creek PAG material are borderline to the primary MCL for drinking water. TDS values in MWMP analyses exceed the secondary MCL for drinking water in Rodeo Creek materials. Barium, leachate pH, zinc, and most other results are well within Nevada water quality standards (**Table 3.4-4**).

As mentioned above, some constituents of primary interest in the region include antimony, arsenic, and mercury. Antimony concentrations are elevated in MWMP results for the Rodeo Creek sulfide materials. Arsenic MWMP values in several materials are elevated above the primary MCL for drinking water, but are within surface water standards (**Table 3.4-4**). Mercury concentrations are all below reporting limits in the samples reported above in MWMP analyses. Selenium concentrations also are of interest to surface water uses. Selenium concentrations exceed the MCL for drinking water in the Rodeo Creek sulfide materials, and exceed aquatic life standards in the Vinini and Rodeo Creek materials. Potential impacts to water quality are summarized in Section 3.4.2, Environmental Consequences.

Existing Waste Rock Material

The historic Dee Mine operated from 1984 to 2000, resulting in the placement of waste rock in the existing WRDF of which a portion would be incorporated into the proposed pit expansion area. The previously placed waste rock was mostly oxidized, which is confirmed by test results from 44 samples collected during the life of the mine. All samples had NNP values greater than 0, and only 8 samples had AGP greater than 5 kg/t. The average NNP of historic samples was 187 kg/t, while the average AGP was 2.6 kg/t (***Schafer 2013***).

Pit Wall Rock Characterization

Rocks exposed in the existing Dee open pit and would be exposed in the proposed pit expansion include a thick wedge of Carlin Formation, oxidized Vinini Formation, and oxidized and unoxidized Rodeo Creek and Bootstrap Formation rocks (**Table 3.4-8**).

Table 3.4-8 Average NNP of Rock Materials Exposed in the Pit Walls in the Existing and Proposed Open Pit

	Existing Dee OpenPit			Proposed Pit Expansion		
Rock Type	Pit Surface (%)	PAG (%)	Average NNP (kg/t)	Pit Surface (%)	PAG (%)	Average NNP (kg/t)
Old Dump Fill - Mostly Vinini	10.60	0.00	39.3	2.00	0.00	39.3
Carlin Formation	18.20	0.00	19.1	28.20	0.00	19.1
Vinini Formation - Oxide	35.20	3.9	39.3	30.80	3.90	39.3
Rodeo Creek - Oxide	20.70	0.00	129.8	10.30	0.00	129.3
Rodeo Creek - Sulfide	1.60	23.40	-	16.10	23.40	-
Bootstrap Oxide	7.70	0.00	591.2	5.60	0.00	591.2
Bootstrap Sulfide	5.90	0.00	857.7	6.90	0.00	857.7
Total	**100.00**	**1.80**	**145.9**	**100.00**	**5.00**	**137.2**

Source: Schafer 2012a.

The Carlin Formation comprises approximately 18.2 percent of the existing Dee open pit surface and 28.2 percent of the future pit surface. The Carlin Formation postdates mineralization and ore deposition and as a result does not contain sulfides or significant amounts of sulfur, and is geochemically inert (***Schafer 2012a***).

The Vinini Formation accounts for 35.2 percent of the rock exposed in the existing Dee open pit surface and 30.8 percent of the proposed pit surface. Backfilled waste rock (mostly Vinini material) also covers 10.6 percent of the existing pit and 2.0 percent of the proposed pit surface. A small fraction (less than 4 percent) of Vinini rocks may have the ability to form acidic conditions upon weathering, and silicic portions of the Vinini may release metals at neutral pH levels.

The Rodeo Creek unit accounts for most of the remaining pit surface area. It is a siltstone containing approximately 8 percent carbonate. Its geochemical behavior depends on whether or not it has been oxidized. Oxidized Rodeo Creek material contains very little sulfide sulfur and is not potentially acid generating. Oxidized Rodeo Creek material accounts for 20.7 percent of the existing exposed pit surface and 10.3 percent of the proposed pit expansion surface. Unoxidized Rodeo Creek material contains an average of 0.9 percent sulfide sulfur. Twenty-four percent (24 percent) of the unoxidized Rodeo Creek samples had more AGP than ANP. Unoxidized Rodeo Creek material is exposed in 1.6 percent of the existing pit surface and would be exposed in 16.1 percent of the proposed open-pit expansion. Unoxidized Rodeo Creek Unit rocks exposed in the pits is potentially acid-generating material.

The last rock type in the existing Dee open pit is the Bootstrap limestone, which also is the primary ore host. The Bootstrap accounts for 13.6 percent of the rock exposed in the current Dee highwall and 12.5 percent of the future pit surface.

3.4.1.5 Water Rights

An inventory of active water rights in the region surrounding the proposed project was used to identify the location and status of water rights within potentially affected areas. The inventory was based on water rights records on file with the NDWR. The inventory identified all active water rights located within the vicinity of the proposed project. For the purpose of the EIS analysis, all groundwater rights owned by BGMI and Cordex Exploration Company that historically conducted exploration activities at the project site, were excluded from this summary. The locations of the points of diversion for the identified water rights in the project vicinity are shown in **Figure 3.4-6**; the owners, beneficial use, and annual duty for each water right are summarized in **Table 3.4-9**. Based on the NDWR database, there are a total of seven active water rights in the inventoried area, which includes one surface water right and six groundwater rights. The only identified surface water right is a spring used for stock watering. No public reserve water rights under the 1926 Executive Order, Public Water Reserve No. 107 were identified in the database within the inventoried area. All other water rights are groundwater rights used for mining.

3.4.2 Environmental Consequences

The primary issues related to water resources include: 1) impacts to groundwater and surface water quality from the construction, operation, and closure of heap leach facilities, waste rock storage facilities, and other mining and processing facilities; 2) impacts from flooding, erosion, and sedimentation associated with mine construction, operation, or closure activities; and 3) impacts related to the water quality of the post-mining pit lakes.

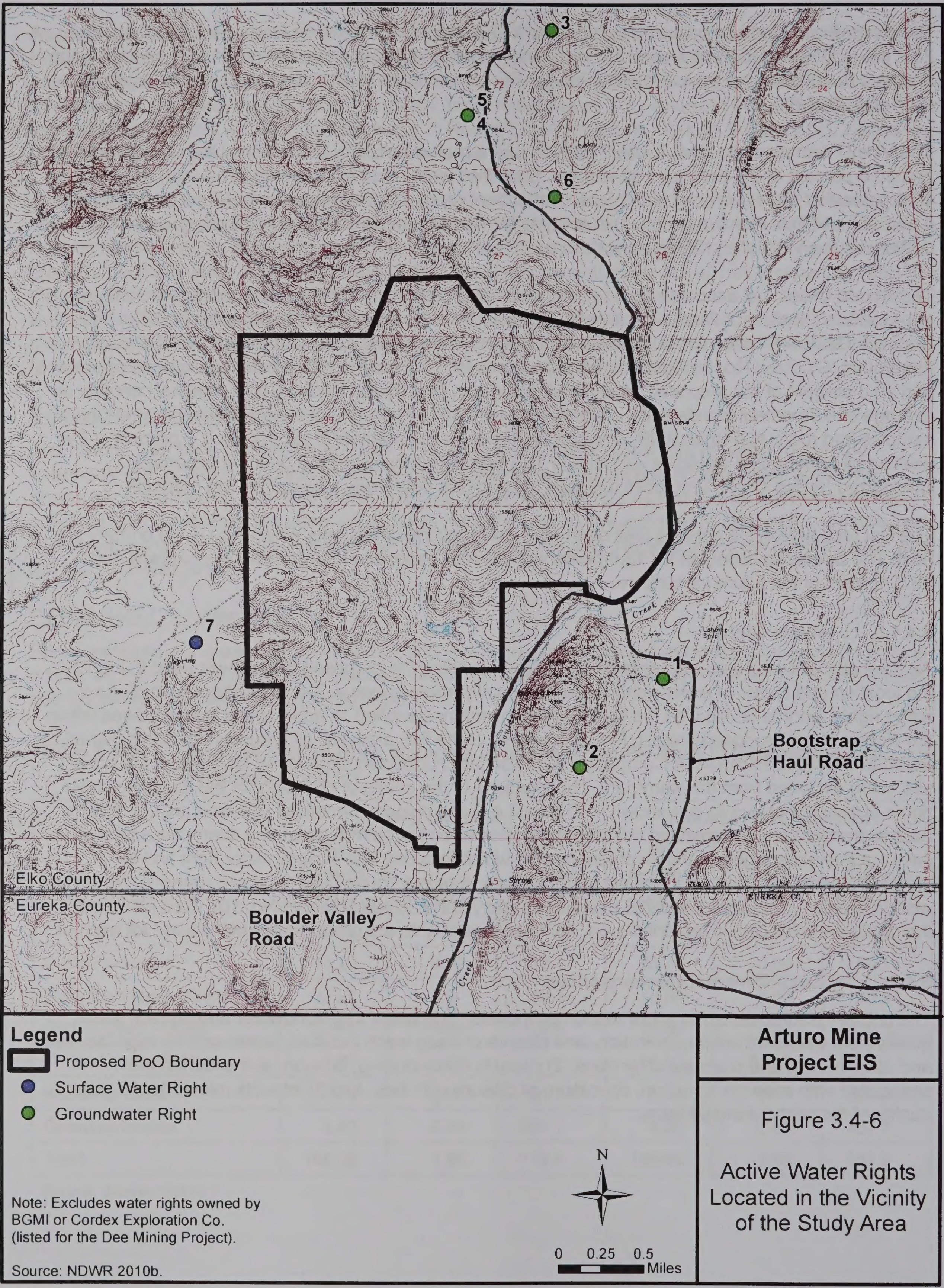


Figure 3.4-6

Active Water Rights Located in the Vicinity of the Study Area

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Table 3.4-9 Active Water Rights Located in the Vicinity of the Proposed Project

Map ID	Application	Certificate	Status	Source	Type of Use	Annual Duty (afy)[1]	Owner of Record
1	17233	5729	Certificate	Underground	Mining-Milling	0.0	Newmont Gold Company
2	26728	9940	Certificate	Underground	Mining-Milling	199.5	Newmont Gold Company
3	42931	15356	Certificate	Underground	Mining-Milling	724.0	Baroid Division
4	61410	15359	Certificate	Underground	Mining-Milling	565.0	Baroid Drilling Fluids, Inc.
5	62578		Permit	Underground	Mining-Milling	1,448.0	Meridian Gold Company
6	62579		Permit	Underground	Mining-Milling	1,448.0	Meridian Gold Company
7	V06236		Vested	Spring	Stock Watering	0.0	26 Ranch Inc. (Spg #5)

[1] acre feet per year (afy).

Source: NDWR 2010b.

3.4.2.1 Proposed Action

Water Quantity Impacts

Impacts to Streams, Springs, Impoundments, and Seeps

No perennial stream reaches are located within the study area, as described previously in Section 3.4.1.2, Surface Water Resources. Under the proposed project, no impacts to perennial streams would occur. Short reaches of unnamed ephemeral stream channels would be removed by proposed project components. These mostly occur in the northeastern part of the proposed project area where the proposed pit expansion and the East WRDF would be located, and the south central part of the proposed project area where Heap Leach Pad No. 12 and associated processing facilities would be located. At the proposed East WRDF, a small ephemeral watershed occupying approximately 360 acres would be affected. Additional ephemeral drainage headwaters would be covered in Section 33 by the West WRDF. The watershed area that would be disturbed by the West WRDF in the northwest corner of the proposed project area, which occupies approximately 240 acres in its undisturbed condition, and contributes only ephemeral flow to Antelope Creek, a tributary of Rock Creek. In the south, the ephemeral drainage is already controlled by existing storm water diversions.

For all of these drainages, runoff from contributing upgradient watersheds would be diverted around the proposed components or contained as described in Chapter 2.0 of the proposed PoO (***SRK 2012***). Accepted engineering practices, including diversion ditches, sediment traps, small containment structures, or other Best Management Practices (BMPs) would be implemented to comply with Nevada storm water management practices for the mining industry.

Based on the lack of perennial stream reaches, the relatively small ephemeral drainages involved, and the proposed storm water management approach, direct impacts to stream flows in Boulder Creek would be of minimal consequence and local in nature.

Drainage Area Considerations

The hydrologic study area occupies approximately 47,360 acres (74 square miles). At monitoring location BC-AA (**Figure 3.4-2**), the upper Boulder Creek watershed area is approximately 17,537 acres (27.4 square miles). Further downstream at monitoring location BC-A, the Boulder Creek watershed area is approximately 47,913 acres (approximately 75 square miles). The removal or re-routing of basin areas for the proposed project would affect the contributing watershed area of upper Boulder Creek. Under existing conditions, approximately 513 acres of disturbance do not drain to the watershed. This acreage includes existing project components such as heap leach pads, tailings disposal facilities, the open pit, and associated isolated drainages. Under the Proposed Action, approximately 1,626 acres of contributing watershed area would be removed from the upper Boulder Creek drainage in the post-mining topographic configuration. This would be an increase in restricted drainage of approximately 1,113 acres from the existing condition in upper Boulder Creek. Overall, the Proposed Action would restrict watershed contributions from approximately 3.4 percent of the approximately 47,360-acre hydrologic study area. Restricted drainage from the Proposed Action would represent approximately 0.45 percent of the 560 square miles of watershed in Boulder Flat (Hydrographic Basin 61).

In the Antelope Creek watershed (which is part of the Rock Creek Valley hydrographic basin 62), approximately 292 acres of the proposed West WRDF would drain to small ephemeral tributaries. These channels run a distance of about one to 1.5 miles from the proposed WRDF footprint to Antelope Creek itself. In addition to the western slopes of the West WRDF, this acreage estimate assumes that a portion of the WRDF would drain westward to the Antelope Creek watershed during high runoff events. At its mouth at the connection with Rock Creek, the overall Antelope Creek watershed occupies approximately 144.4 square miles (92,416 acres), or about one-third of the Rock Creek Valley hydrographic basin. The watershed area affected by the proposed WRDF would represent approximately 0.3 percent of the Antelope Creek drainage and about 0.1 percent of the Rock Creek Valley Hydrographic Basin.

The areas that would be affected by the Proposed Action are drained in the project area by ephemeral streams. The impacts of drainage modifications on flow quantities in Boulder Creek or Antelope Creek would probably not be measurable.

The existing impoundments in the proposed project area described in Section 3.4.1.2, Surface Water Resources, and shown in **Figure 2-3** would not be removed by the proposed project. Direct disturbance to these features by the proposed project footprint would be avoided. Potential water quality impacts to these features are discussed below in the water quality assessment. Upgradient watershed areas that contribute to the ponds would be disturbed primarily by the southern part of the West WRDF and ancillary features on the north side of proposed Heap Leach Pad No. 12. Topographic modifications and storm water control features would reduce the contributing watershed area for the upgradient small pond. This temporarily may reduce the amount of runoff stored in that pond (or routed to the lower pond) until recontouring and reclamation are completed as proposed. Water would still collect in both ponds, since the West WRDF would be reclaimed as the proposed project proceeds, and some existing contributing drainage area would not be incrementally disturbed. However, the extent of open water habitat and fringing wetlands may be somewhat reduced. No springs would be removed by the proposed project. Seeps and non-jurisdictional wetlands would be incrementally removed either by burial under proposed project components or by removal of water sources adjacent to the proposed pit expansion. The seeps and springs identified within the proposed project area and nearby locations are indicated in **Figure 3.4-2**. Based on inventories (Cedar Creek 2009) and comparison of the existing and authorized disturbance footprint to the proposed project (**Figure 3.4-2**), the following 12 seep features would be incrementally removed:

- AR01, AR02, AR03, and AR04 are seeps in the middle of Section 3, Township 36 North, Range 49 East, that would be removed or drained by the proposed open pit expansion.

- AR10, AR11, AR12, AR13, AR14, and AR15 are seeps or catchments (such as remnant collection ponds or basins constructed during mining operations) that would be buried or otherwise removed by construction of the West WRDF or Heap Leach Number 12.
- AR17 and AR19 are, respectively, a drainage bottom wetland with open water and a seep area dominated by crested wheatgrass (Cedar Creek 2009).

These impacts would minimally affect surface water or groundwater resources, and would primarily involve habitat effects.

Potential impacts to floodplains and flood hydrology from the proposed project would be minimal. No federally delineated flood hazard zones have been identified within the proposed project area, and drainageways consist of narrow ephemerals. Storm water drainage ditches and small catchments would be constructed to manage runoff according to the NDEP and BLM requirements.

Impacts to Water Rights

Potential impacts to the water rights identified in **Table 3.4-9** are not anticipated. There are no surface water rights identified within the proposed project area. The proposed project is not expected to result in measurable effects to water levels in the regional aquifer associated with the groundwater rights.

Impacts to Water Levels

As described in Section 3.4.1.3, Groundwater Resources, the depth to groundwater beneath the study area is controlled by dewatering at the BGMI facility. Mine dewatering activities at the BGMI facility have resulted in lowering the groundwater levels approximately 1,700 feet within an approximately 2.5-mile-wide, northwest-trending zone that extends from the Betze/Post Pit to near the center of the proposed project area (**Figure 3.4-5**). Therefore, mine dewatering would not be required for the proposed project, except as necessary to control localized perched groundwater that may be encountered in the Carlin Formation during open-pit mining. Water captured during open-pit mining would be used on site for dust suppression, processing, or evaporated.

The estimated average water requirement for the proposed project is 1,120 afy (700 gpm). This water would be supplied by pumping groundwater from existing or new wells. The most likely target for the groundwater development would be the carbonate aquifer. The current maintenance pumping rate at the BGMI facility to sustain water levels at the 3,576-foot amsl level is approximately 15,000 gpm. The pumping rate required to maintain the drawdown varies within a few hundred gpm from quarter to quarter but has remained relatively constant over the past several years. (For example, in the fourth quarter of 2009 the average pumping rate was 15, 310 gpm; and in the first quarter of 2010 the average pumping rate was 15,880 gpm [BGMI 2010]). Considering the extremely high transmissivity of the carbonate aquifer (JSA 2010a) and flat hydraulic gradient between the Betze Pit to the proposed project area, pumping required for the proposed project from the carbonate aquifer likely would be offset by an equivalent reduction in pumping from the same aquifer at the BGMI facility. Consequently, pumping required for the proposed project is unlikely to result in additional drawdown in the carbonate aquifer over that which was previously predicted and analyzed for the BGMI facility (BLM 2008b, 2000c).

After dewatering ceases at the BMGI facility, the groundwater levels in the carbonate aquifer would rise above the bottom of the proposed open pit and result in the development of three separate pit lakes in the West, South, and East Pits. The estimated timeframe for development and predicted water quality of the pit lakes is discussed in the "Water Quality Impacts" section below.

Water Quality Impacts

Pit Lake Water Quality Evaluation

Pit Lake Development Predictions

The BGMI regional hydrologic model was used to predict the rate of recovery and water balance and pit lake development for the final open-pit configuration. As part of the modeling process, the previous model was updated and refined to more accurately represent the hydrogeologic conditions in the proposed pit expansion area. Model updates included: 1) refining the model grid spacing; 2) increasing the number of model layers from four to six; 3) incorporating new information or improving the model representation of field conditions; and 4) recalibration, as described in JSA (2010a).

The proposed pit expansion would expand the existing pit to include three lobes incorporated into the overall open-pit boundary that, for discussion purposes, are referred to as the North Pit, South Pit, and East Pit. Dewatering at the BGMI facility is predicted to end in 2021, after which regional groundwater levels gradually would rise. When the water table rises above the bottom of the pit, the pit would begin to fill, and three separate permanent pit lakes would form. Prior to that time, direct precipitation and runoff from the pit walls, combined with discharge from localized perched zones containing groundwater that are intercepted by the pit walls, could result in the development of a shallow lake up to several feet deep that would be either perennial, seasonal, or ephemeral, depending on the infiltration rates through the pit bottom (JSA 2010b).

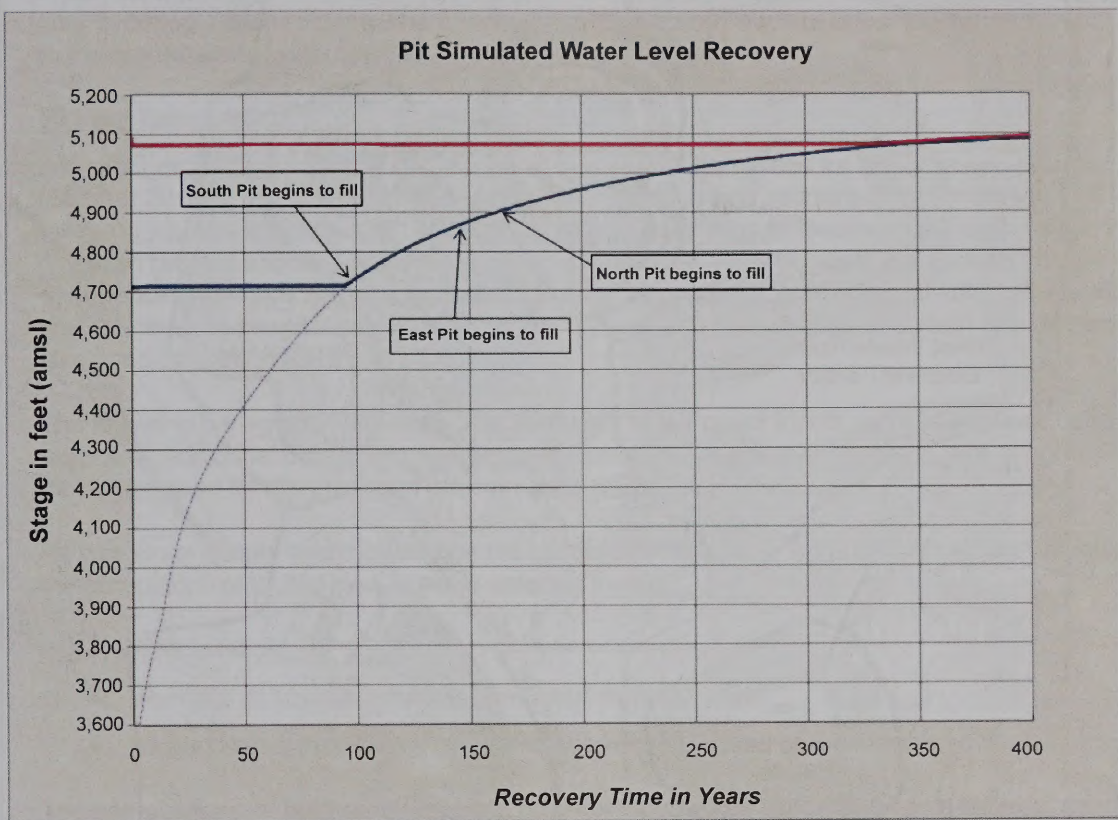
The elevation of the water surface in the pit lake over time and the final water level is dependent primarily on the water level recovery in the carbonate aquifer. Because of the high transmissivity of the carbonate aquifer, and the hydraulic interconnection between the three pit lakes, the water levels in each of the pit lakes are predicted to be the same. The model-simulated recovery of groundwater levels and development of the pit lakes is shown in **Figure 3.4-7**. The South Pit would begin to form first after approximately 100 years, followed by the East Pit at Year 150, and finally the North Pit at Year 170. Water levels in all three pits would then rise at the same rate (determined by the recovery curve for the carbonate aquifer) until a steady state was reached, after approximately 400 years. The final pit lake area is illustrated in **Figure 3.4-8**; predicted surface area, volume, and depth from each of the pit lakes are summarized in **Table 3.4-10**.

Table 3.4-10 Predicted Pit Lake Development Summary for the Proposed Action and Alternatives

Alternative[1]	Pit Lake Location	Lake Surface Area (acre)	Lake Volume (acre-feet)	Lake Surface Elevation (feet amsl)	Pit Floor Elevation (deepest) (feet amsl)	Maximum Depth (feet)	Groundwater Outflow at 400 years (Yes/No) (afy)
Proposed Action	South Pit	41.9	5,411	5,093	4,730	363	No
Proposed Action	East Pit	27.3	2,281	5,093	4,910	183	No
Proposed Action	North Pit	19.9	2,478	5,093	4,890	203	No
Total		**89.1**	**10,170**				
Partial Pit Backfill Alternative	North Pit	19.9	2,663	5,093	4,890	203	No
No Action Alternative	Dee Open Pit	0.6	6.5	5,093	5,053	40	Yes

[1] Predicted pit lake development for the Single WRDF Alternative would be the same as the Proposed Action.

Source: JSA 2011, 2010b,c; Schafer 2012a, 2011d; SRK 2012.



Legend

- Regional Aquifer Water Level
- Proposed Arturo Pit
- Existing Dee Pit

Source: Schafer 2012a.

Dee Arturo Expansion Project

Figure 3.4-7

Comparison of Predicted Rate of Filling for the Existing Dee Pit and the Proposed Arturo Pit

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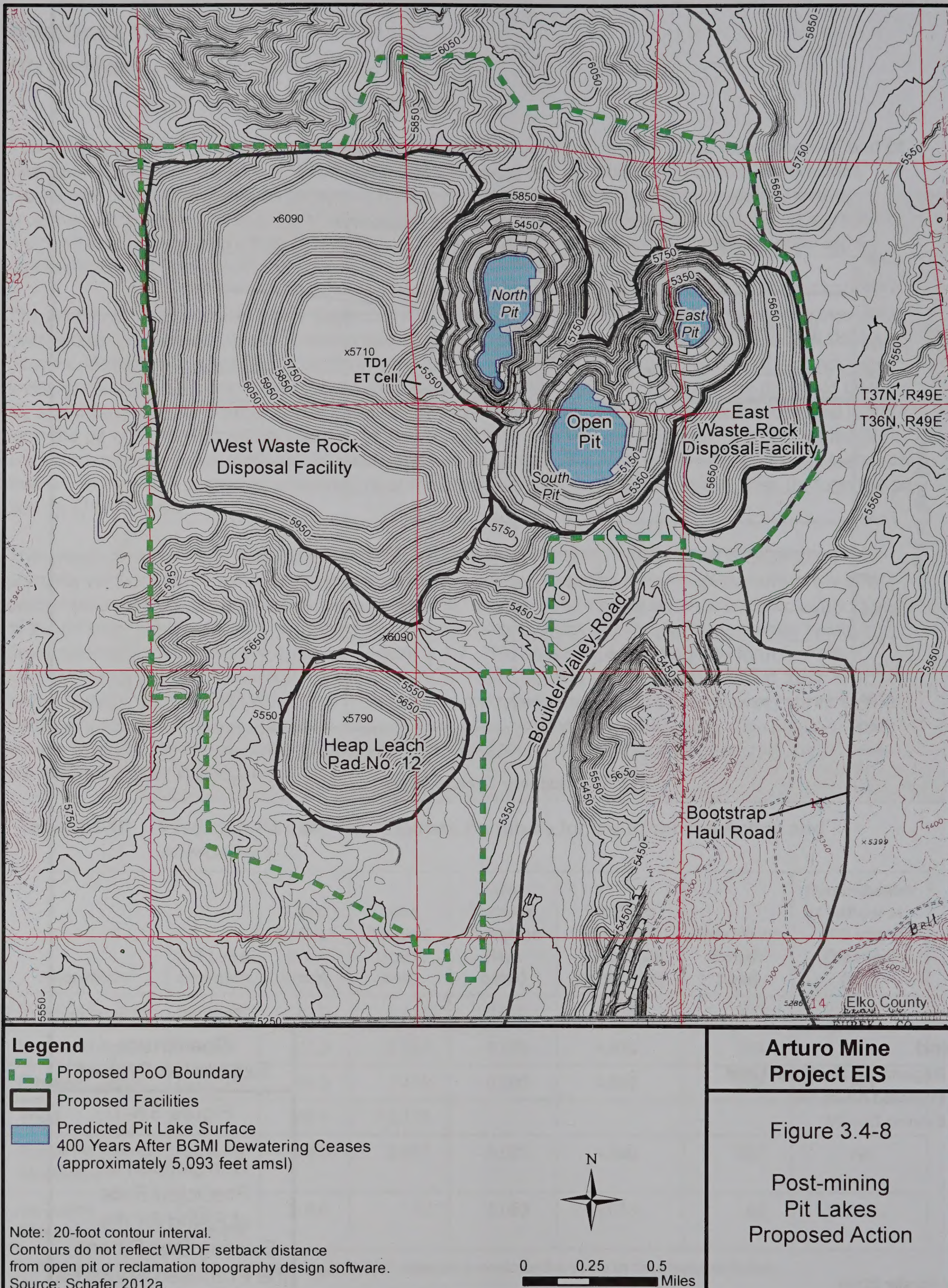

Arturo Mine Project EIS

Figure 3.4-8

Post-mining Pit Lakes Proposed Action

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The model predicts that during the early stages of recovery, local water tables would develop in the Carlin and Vinini formations that represent perched groundwater systems above the carbonate aquifer system. During the first 110 years, runoff and groundwater inflow from perched aquifer zones intercepted in the pit would be discharged primarily as groundwater infiltration to the carbonate aquifer. Between approximately 110 and 200 years, the amount of pit water discharged gradually would be reduced as the lake volume and surface area increase and the amount of water lost through evaporation increases. After approximately 200 years of recovery, the pit lakes are expected to behave as a strong sink (i.e., hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater system) (JSA 2010b).

Pit Lake Geochemical Modeling Methodology

A hydrochemical evaluation of pit lake water quality was performed for the proposed project (Schafer 2012a). In this evaluation, water quality in the pit was estimated from modeling that included the following inputs and reactions: 1) the quality and quantity of groundwater inflow and outflow; 2) pyrite oxidation rates in exposed wall rock; 3) chemical releases from oxidized wall rock and waste rock; 4) aqueous geochemical reactions in the pit lakes; 5) evaporation from the pit lake surfaces; 6) direct precipitation into the pit lakes; 7) runoff from pit walls; and 8) exchange of carbon dioxide between the pit lakes and the atmosphere.

The following paragraphs provide a brief summary of the major inputs and assumptions used in the modeling. Additional details and supporting information are provided in the pit lake geochemistry modeling report for the proposed project (Schafer 2012a).

Pit lake water quality was modeled on the assumption that water compositions would be determined by the proportions of three types of water entering the pit:

- Precipitation;
- Runoff that flows across the weathered highwall; and
- Groundwater that flows through the submerged portion of the weathered highwall.

The compositions of both runoff and groundwater input would vary with time as different rock types are exposed/submerged in the pit walls. Groundwater inputs from different aquifers would vary as a result of water level changes. The three pits are very similar but, because their geometries and predicted wall rock compositions are not identical, each was modeled separately.

Precipitation. Average annual precipitation amounts were based on long-term records from the Elko Airport supplemented by monitoring at the BGMI facility over the past 18 years. A value of 10 inches per year was used in the modeling.

Pit Wall Geochemistry. The rocks exposed in the pit highwall play an important role in determining pit lake water quality. The amount of chemical load that may be rinsed from the highwall is closely related to the acid generation potential of the rock. The majority of the rock in the highwall is either oxidized or contains abundant carbonate minerals or both. Consequently, the average NNP of exposed highwall rock in the existing and proposed pit is 146 kg/t and 137 kg/t, respectively (**Table 3.4-8**). Overall, 1.8 percent of the existing pit walls and 5 percent of the proposed pit surface contains rock that would be considered PAG based on NNP values less than 0 kg/t (Schafer 2012a).

Runoff from Pit Walls. The pit walls would consist of four stratigraphic units, the Carlin Formation, the Vinini Formation, the Rodeo Creek Unit, and the Bootstrap Limestone described in Section 3.3.1.4, Site Geology and Mineralization. Runoff would result from both meteoric water input and groundwater discharge above the level of the contemporaneous pit lake. Runoff compositions from each lithology in

the exposed wall rock were estimated from a series of experiments: rinsing experiments on fresh and weathered rocks, humidity cell tests, and meteoric water mobility tests (Schafer 2012a).

Groundwater Inflow. The inflow of groundwater from each aquifer to each pit over time was estimated using the calibrated regional hydrologic model described previously. Water is derived from three aquifers: the Carlin Aquifer, the Vinini Aquifer, and the carbonate aquifer. In the long-term, the carbonate aquifer would be the dominant source of water to all three pits.

Geochemical Modeling. After the inputs to the lakes had been calculated, the geochemical evolution of the resulting lake was calculated using the geochemical computer program PHREEQC (Parkhurst and Appelo 1999). PHREEQC can perform various calculations, including chemical equilibrium with selected solid phases, equilibration with an atmosphere, equilibration at operator-selected redox levels, and evaporation. The output from PHREEQC provides predictions of the chemical composition of water after chemical equilibration (and other specified reactions) has taken place.

During the early stages of pit filling, most of the water flowing into the pit lakes would come from highwall runoff with lesser amounts of groundwater from the Carlin and Vinini aquifers. Until groundwater levels reach the base of the pits, virtually all water that enters the pits would infiltrate out of the bottom of the pits into the carbonate aquifer.

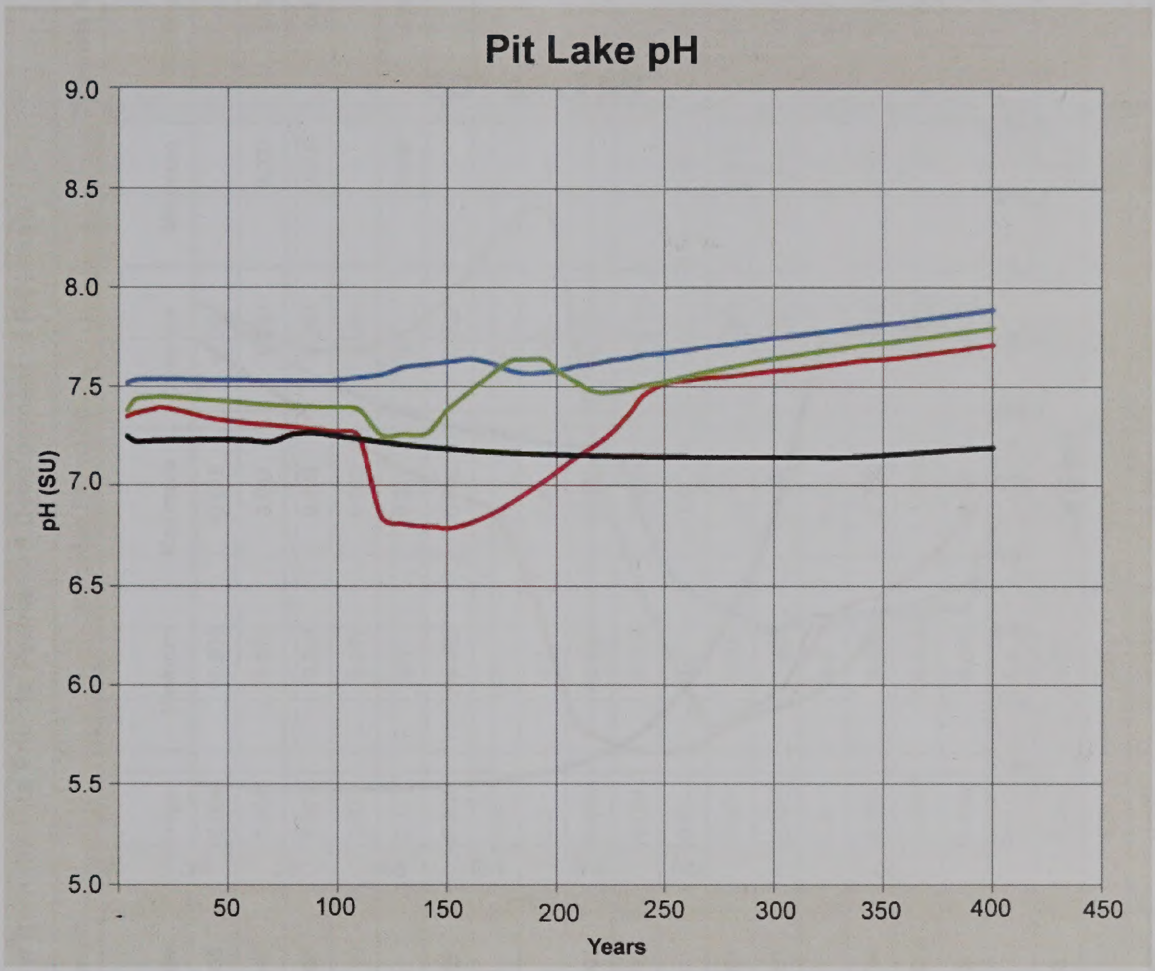
<u>Pit Water Infiltration to Groundwater</u>

Water that accumulates in the pits during the first approximately 150 to 200 years of recovery, and does not evaporate, is predicted to infiltrate into the floor of the pit and discharge into the carbonate aquifer system (JSA 2010b). The estimated rate of infiltration is approximately 75 afy (50 gpm) at the initial stage of recovery, increases to approximately 150 afy (90 gpm) by Year 100, and then gradually declines to zero when the permanent pit lakes form as a result of inflow from the carbonate aquifer after 200 years.

The composition of the infiltrating water was predicted by the same procedure based on PHREEQC as was used for the final pit lakes. The pit water captured in the South, East, and North Pit lakes would have an initial pH of approximately 7.3 to 7.5 and a TDS of 600 to 900 mg/l (**Figures 3.4-9** and **3.4-10**, respectively). The TDS is predicted to gradually decrease as the highwall is rinsed by meteoric water. A sharp increase in the TDS concentrations would occur when inflow from the carbonate aquifer begins.

This results from a renewed influx of soluble salts as weathered carbonate rock is rinsed by flow from the carbonate aquifer.

Nevada regulations address the post-mining pit lakes and provide that pit lakes must not have the potential to degrade groundwaters of the State or adversely affect the health of human, terrestrial, or avian life (NAC 445A.429[3]). The predicted water chemistry of the infiltrated pit water is summarized in **Table 3.4-11**. This predicted water quality also represents the quality of any shallow ponding that may occur in the pit prior to permanent pit lake development. Predicted concentrations of antimony, arsenic, nickel, and selenium in the infiltration water from one or more of the pit lake areas would exceed the primary Nevada water quality standards for drinking water. In addition, the predicted manganese concentrations, and TDS ***concentrations*** from one or more of the pit lake areas would exceed the Nevada secondary drinking water standards. The minimum, maximum, and average concentrations in the carbonate aquifer also are listed for comparison in **Table 3.4-11**. ***Of these constituents with exceedances of primary or secondary water quality standards t***he predicted average concentrations of ***arsenic, selenium, manganese, and TDS*** over the infiltration period also would exceed the average background water quality for the carbonate aquifer in the region. However, the range of concentrations of antimony and arsenic predicted for the proposed pit are within the range of concentrations that naturally exist in the carbonate aquifer. The maximum predicted concentration of selenium (0.084 mg/l), and manganese (0.306) would be greater than the maximum concentrations reported for the carbonate aquifer.



Legend

- South Pit
- North Pit
- East Pit
- Existing Pit

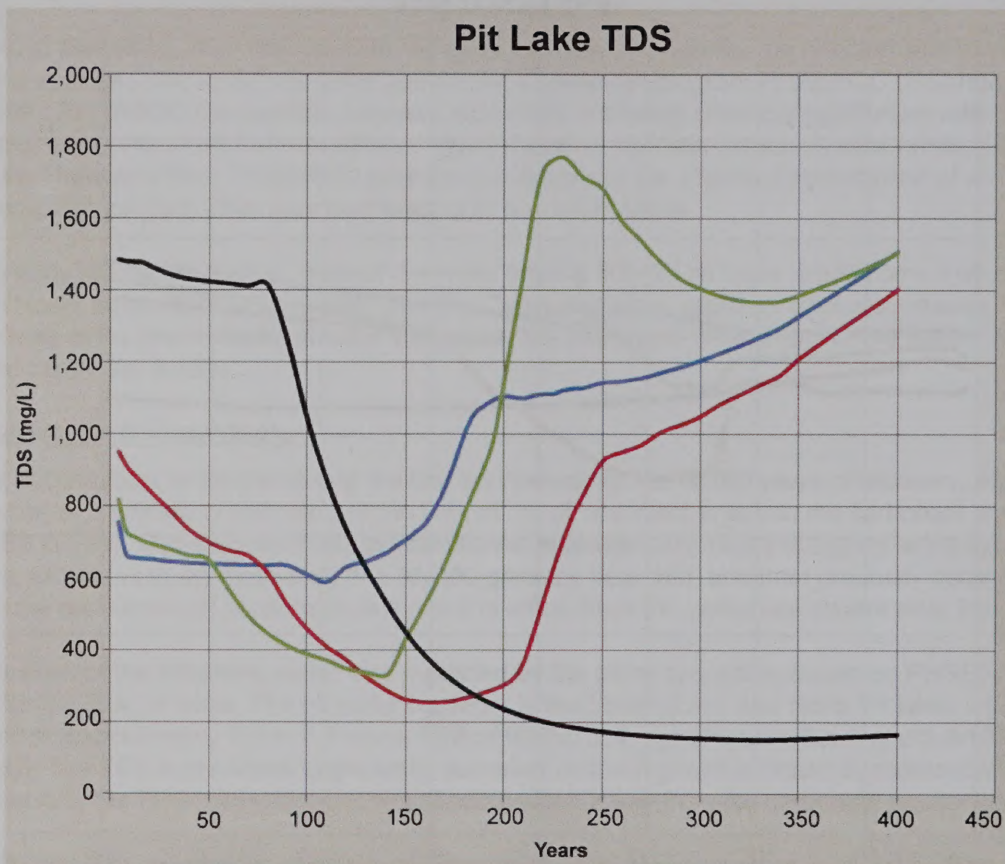
Source: Schafer 2012a.

Dee Arturo Expansion Project

Figure 3.4-9

Predicted Trends in pH for the South, North, and East Pit Lakes (Proposed Action) and Existing Pit (No Action)

05/21/2012



Legend
- South Pit
- North Pit
- East Pit
- Existing Pit

Source: Schafer 2012a.

05/16/12

Dee Arturo Expansion Project

Figure 3.4-10

Predicted Trends in TDS for the South, North, and East Pit Lakes (Proposed Action) and Existing Pit (No Action)

Table 3.4-11 Predicted Water Quality of Outflow from the Pits Prior to Permanent Development of Pit Lakes

Constituent (mg/l)[1]	Nevada Drinking Water Standards[2]	No Action Pit			Proposed Project Pit			Carbonate Aquifer[7]		
		Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Aluminum	0.054[3] – 0.2[4]	<0.004	<0.005	<0.004	<0.005	<0.018	<0.004			
Antimony	0.006	**0.036**	**0.042**	**0.038**	**0.019**	**0.041**	**0.021**	**0.022**	**0.050**	**0.035**
Arsenic (total)	0.01	0.010	**0.097**	**0.029**	**0.024**	**0.088**	**0.059**	0.008	**0.451**	**0.021**
Barium	2.0	0.032	0.110	0.075	0.049	0.085	0.061			
Boron	--	0.0	0.5	0.1	0.0	0.2	0.1	0.600	0.847	0.767
Cadmium	0.005	<0.002	<0.006	<0.003	<0.002	<0.003	<0.002			
Calcium	--	128.2	397.2	209.8	152	229	182.7	39	109	88.9
Chloride	250[3], 400[4]	3.8	15.3	5.3	4.3	17.6	13.9	3.0	19	14.9
Chromium (total)	0.1	<0.001	<0.001	<0.001	<0.001	<0.007	<0.001			
Copper	1.3[5], 1.0[4]	0.001	0.012	0.004	0.008	0.018	0.010			
Fluoride	2.0[3], 4.0[4]	0.9	1.9	0.9	1.0	1.9	1.1	0.6	1.6	1.3
Iron	0.3[3], 0.6[4]	0.001	0.001	0.001	0.004	0.001	0.005	0.030	14.7	0.308
Lead	0.015[5]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	0.007
Magnesium	125[3], 150[4]	8.9	78.3	30.6	18.0	45.2	33.1	19.0	32.0	21.9
Manganese	0.05[3], 0.1[4]	0.034	**0.724**	**0.098**	**0.053**	**0.306**	**0.094**	0.007	**0.092**	0.013
Mercury	0.002	< 0.0007	< 0.0008	< 0.0007	< 0.0003	< 0.0006	< 0.0004	0.001	0.00222	0.0007
Nickel	0.1	0.069	**0.285**	**0.104**	0.046	**0.137**	0.065			
Nitrate (as N)	10	0.1	0.3	0.1	0.4	0.8	0.5			
pH (standard units)	6.5 – 8.5[4]	6.85	6.99	6.94	6.93	6.98	6.96	5.1	8	6.7
Potassium	--	5.3	16.1	6.5	6.5	10.4	7.3	6.6	25	20.9
Selenium	0.05	0.005	**0.207**	0.022	0.009	**0.084**	0.021	0.002	0.004	0.004

Table 3.4-11 Predicted Water Quality of Outflow from the Pits Prior to Permanent Development of Pit Lakes

Constituent (mg/l)[1]	Nevada Drinking Water Standards[2]	No Action Pit			Proposed Project Pit			Carbonate Aquifer[7]		
		Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Silver	0.1[4]	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001			
Sodium	--	8.9	59.4	13.6	152.0	229.0	182.7	21.0	85.5	73.9
Sulfate	250[3], 500[4]	36.7	**897.9**	308.0	137.5	410.6	260.9	48	160	77.0
Thallium	0.002	0.000	0.014	0.001	0.0005	0.006	0.001	<0.001	<0.001	<0.001
Bicarbonate	--	407.9	488.9	461.4	457.0	501.0	475.9	195	582	414.5
TDS[6]	500[3], 1,000[4]	***603***	***1,961***	***1,043***	***802***	***1,287***	***1,024***	310	672	566.2
Zinc	5.0[4]	0.040	1.749	0.501	0.625	01.969	0.769			0.017

1 Units are mg/l unless otherwise noted.

2 Nevada primary MCLs unless otherwise noted.

3 Federal secondary MCLs.

4 Nevada secondary MCLs.

5 Value is action level for treatment technique for lead and copper.

6 For the No Action and Proposed Action pit lakes; the TDS is dominated by calcium and bicarbonate ions, whose high concentrations are an artifact of the very high partial pressure of carbon dioxide determined for the carbonate aquifer. If atmospheric carbon dioxide levels are applied, the resulting average TDS values are less than 500 mg/l (Schafer 2012a).

7 Source for carbonate aquifer data: BLM 2008b, Table B-2.

Note: Bold values exceed Nevada Drinking Water Standards.

Source: Schafer 2012a.

The movement of infiltration from the open pit was evaluated using the regional groundwater flow model described previously. Specifically, particle tracking was used to identify the likely flow paths that would occur over time from the infiltrating water (JSA 2010d). The results indicate that flow infiltrating in the pit area at Year zero would travel south toward the Betze Pit. Later flow (released at 50, 100 years, and 150 years after the start of recovery) would travel toward the west.

Attenuation batch testing and numerical modeling were conducted to assess the potential fate and transport of key metals and TDS that may infiltrate through the pit floors into bedrock prior to development of permanent pit lakes controlled by recovery of the regional carbonate aquifer. The Bootstrap Formation would be exposed in the floor of the proposed pits and would be the receptor of flow that infiltrates from the pit prior to pit lake development. Minerals within the Bootstrap Formation may absorb or precipitate dissolved constituents within the solutions that infiltrate the pit floor. Samples of rock core taken from the Bootstrap Formation were selected to represent materials that would be exposed in the pit floor. These samples were then tested to evaluate the sorption capacity for the six metals of concern (arsenic, antimony, manganese, nickel, selenium and thallium). Although some of the isotherms are not well constrained, the experiments do show strong adsorption of the elements of interest, which indicates that migration would be limited. Overall, the results of the batch testing indicate that the Bootstrap Formation has the capacity to absorb and precipitate constituents of concern and inhibit migration (Geomega 2011; Schafer 2012b, 2011b)

Solute transport modeling was conducted to simulate sorption along potential flow paths between the pit bottom and the groundwater aquifer. For simplicity, water infiltrating the pit flow was assumed to connect with the deeper aquifer system with no retention time or attenuation in the vadoze zone. The analysis was conservative since it did not account for dilution or dispersion that would occur as the pit infiltrate entered the groundwater flow system. Separate model simulations were conducted for each constituent of concern. The results of the modeling indicate that the elevated metals concentrations would not be detected further than 20 to 50 meters (70 to 170 feet) from the margin of the pit. TDS of water infiltrating from the pits would be less than 500 mg/l ***(at atmospheric conditions)***, but would increase in the deeper aquifer due to calcite dissolution. If the deep groundwater were pumped to the surface for use, its TDS would again drop below 500 mg/l under atmospheric conditions due to off-gassing and calcite precipitation. (Schafer 2011b). Because elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits, infiltration from the pits is not ***expected*** to adversely affect the ***water quality in the downgradient*** carbonate aquifer.

<u>Pit Water Quality Predictions</u>

As described previously, permanent pit lakes are predicted to develop in the South, East, and North Pits at 100, 150, and 170 years, respectively, when inflow from the carbonate aquifer enters the pit areas. The pH predictions shown in **Figure 3.4-9** indicate that the lakes would be near neutral (pH 6.8 to 8). This new source of inflow (i.e., the carbonate aquifer) would result in the rinsing of soluble salts in the weathered carbonate and would result in a sharp increase in TDS (**Figure 3.4-10**). Once permanent pit lakes form, groundwater outflow would cease and evapoconcentration would result in a gradual increase in TDS, reaching TDS levels of 1,400 to 1,500 mg/l at the end of the simulation period. In the longer term (beyond 400 years), the salinity of the pit lakes steadily would increase in response to evaporation. Groundwater would continue to flow into the pits to replace water lost by evaporation, and the solutes in the water (other than those lost by precipitation of carbonate) would accumulate.

Water in the South, North, and East pit lakes would be calcium-sulfate type water initially and would transition to calcium-bicarbonate water as highwall rinsing progresses and then sodium-bicarbonate water after approximately 300 years due to evaporation and precipitation of calcium carbonate.

The behavior of several trace elements, and hydrous ferric oxide, is sensitive to redox conditions in the water. It was assumed in the modeling that the pit lake waters would remain oxidizing. A review of pit lakes that are analogous to the pit lakes that would develop under the Proposed Action (Schafer 2012a)

indicates that the pit lakes are likely to turn over seasonally: once or more each year. It is, therefore, realistic to assume that the waters would remain oxidizing at all depths.

The long-term (400-year) predicted pit lake water chemistry for the Proposed Action is summarized in **Table 3.4-12**. Although the pit lakes are not intended to be used as a drinking water source for human consumption, **Table 3.4-12** includes the current Nevada Drinking Water Standards as a reference. The pit lake water has predicted constituent concentrations that exceeded the Nevada primary water quality standards for antimony and arsenic. The predicted concentrations of fluoride, manganese, sulfate, and TDS also exceed the Nevada secondary drinking water standards. These pit lakes are predicted to eventually behave as groundwater sinks. As a result, it is anticipated that in the long term (after approximately 200 years), these lakes would not affect the water quality of downgradient aquifers. The potential risk to wildlife associated with exposure to the pit lakes is addressed in Section 3.17, Wildlife and Aquatic Biological Resources.

Waste Rock Disposal Facilities

The geochemical testing data for waste rock material is summarized in Section 3.4.1.4, Rock Geochemistry. Exploration drilling data and geochemical testing results were entered into a geologic block model to estimate the waste materials and mass of PAG waste rock generated during mining (**Table 3.4-13**). The modeling indicates that approximately 3.5 percent of the total waste rock tonnage may be acid generating. A large fraction of the waste rock tonnage (46 percent) would be from the Carlin Formation, the oxidized Bootstrap, and oxidized Rodeo Creek material, which are non acid-generating. The next largest group of waste rock material (39 percent) is Vinini Formation, which has a small percentage (3.9 percent) of material that may generate acid. The Rodeo Creek sulfide material comprises approximately 8.5 percent of the total waste rock material, and approximately 23 percent of the Rodeo Creek sulfide bearing material is potentially acid-generating.

The metals leaching risk of rocks is closely related to the solution pH. Samples that generated acidic conditions (<5.5) in MWMP tests or humidity cell tests had moderate to high levels of base metals while near-neutral samples had mostly low base metal levels. Some rock samples contained elevated levels of arsenic and antimony, but rarely mercury. Although soluble levels of oxyanions are often elevated at alkaline pH levels, the majority of these elements are retained in solid phase. In materials containing oxidized iron, an important mechanism that reduces the mobility of these metals is sorption on iron oxyhydroxides. Consequently, although small pockets of mineralized rock within the WRDFs may generate higher levels of soluble metals, arsenic and antimony would tend to become sorbed by adjacent rock masses as interstitial water from these zones migrates (Schafer ***2013***).

Table 3.4-12 Model-predicted Pit Lake Water Chemistry at Year 400

Constituent (mg/l)[1]	Nevada Drinking Water Standards[2]	No Action Pit Lake	Proposed Action Pit Lakes			Partial Backfill (North Pit Lake)
			South	North	East	
Aluminum	0.05[3] – 0.2[4]	0.004	0.009	0.007	0.006	0.007
Antimony	0.006	**0.041**	**0.099**	**0.14**	**0.104**	**0.085**
Arsenic (total)	0.01	**0.037**	0.009	0.0005	0.003	**0.011**
Barium	2.0	0.110	0.042	0.038	0.038	0.039
Boron	--	0.03	1.7	1.8	1.7	
Cadmium	0.005	0.003	0.001	0.001	0.001	0.001
Calcium	--	18	30	68	48	82
Chloride	250[3], 400[4]	4	79	50	68	38
Chromium (total)	0.1	<0.001	<0.001	<0.001	<0.001	0.0014
Copper	1.3[5], 1.0[4]	0.001	0.031	0.021	0.026	0.020
Fluoride	2.0[3], 4.0[4]	1.0	**4.3**	**5.0**	**4.5**	3.7
Iron	0.3[3], 0.6[4]	< 0.001	< 0.001	< 0.001	< 0.001	<0.001
Lead	0.015[5]	<0.0001	0.0004	<0.0001	<0.0001	0.0002
Magnesium	125[3], 150[4]	10	117	106	116	92
Manganese	0.05[3], 0.1[4]	0.04	**0.20**	**0.30**	**0.28**	**0.25**
Mercury	0.002	< 0.001	< 0.003	< 0.004	< 0.003	0.002
Nickel	0.1	0.07	0.13	0.25	0.20	0.23
Nitrate (as N)	10	0.1	2.3	1.5	2.3	1.4
pH (standard units)	6.5 – 8.5[4]	7.20	7.89	7.71	7.80	7.67
Potassium	--	6	62	69	63	50
Selenium	0.05	0.006	0.023	0.036	0.032	0.032
Silver	0.1[4]	<0.001	<0.005	<0.0016	<0.005	0.004
Sodium	--	10	245	211	230	156
Sulfate	250[3], 500[4]	39	**548**	**603**	**624**	**562**
Thallium	0.002	0.0003	<0.002	<0.002	<0.002	0.002
Bicarbonate	--	69	347	235	282	210
TDS	500[3], 1000[4]	157	1428	1343	1432	1190
Zinc	5.0[4]	0.04	0.19	0.43	0.29	0.768

[1] Units are mg/l unless otherwise noted.
[2] Nevada primary MCLs unless otherwise noted.
[3] Federal secondary MCLs.
[4] Nevada secondary MCLs.
[5] Value is action level for treatment technique for lead and copper.
Note: Bold values exceed Nevada drinking water standards.
Source: Schafer 2012a, 2011c.

Table 3.4-13 Estimated Waste Rock Generated by Proposed Action Mining

Waste Material Type	Estimated Tons	Percent of Total Waste Rock	Estimated Tons of PAG	Percent PAG
Fill	33,300,000	5.5	0	0
Carlin	228,200,000	38.0	0	0
Vinini	235,800,000	39.3	9,196,200	3.9
Rodeo Creek Oxide	40,400,000	6.7	0	0
Rodeo Creek Sulfide	50,900,000	8.5	11,910,600	23.4
Bootstrap Oxide	6,505,000	1.1	0	0
Bootstrap Sulfide	5,207,000	0.9	0	0
Total Waste	**600,312,000**	**100.0**	**21,106,800**	**3.5**

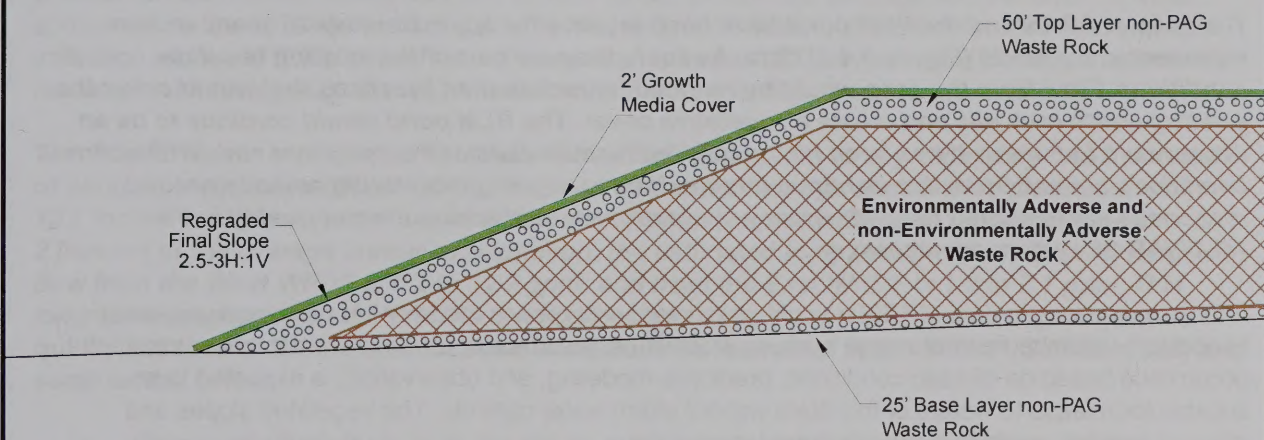
Source: Schafer 2013.

The strategy for handling waste rock material is presented in the Waste Rock Management Plan prepared by Schafer for the PoO (***Schafer 2013***). Waste rock would be placed into an expanded footprint of the West WRDF and a new East WRDF (Section 2.3.3, Waste Rock Disposal Facilities). A conceptual diagram of the environmental protection measures incorporated into the design of the WRDFs shown in **Figure 3.4-11**. Construction, operation and management, and closure and reclamation of the facilities would include BMPs for storm water management and erosion control (Section 2.3.9.7, Water Resource Protection).

Waste rock units classified as "environmentally adverse" contain rock with the potential to become acidic, leach metals, or both. Environmentally adverse rock would account for an estimated ***9*** percent of the material placed in the WRDFs (***Schafer 2013***). Under the proposed waste rock handling plan, this material would be identified during mining and managed during development of the WRDFs. Environmentally adverse waste rock would be intermixed with oxidized waste rock and not segregated. This intermixed waste rock material would be underlain and covered by a shell of waste rock classified as oxidized (i.e., non-PAG). The minimum thickness of the oxidized (non-PAG) shell would be 25 feet at the base of the facility, and 50 feet along the sides and top of the final reclaimed facility (***Schafer 2013***). The perimeter shell would ensure that migrating water contacting acid forming rock in the interior of the facility also would encounter acid neutralizing rock in the perimeter shell before exiting the facility.

Acid-base accounting tests results for waste rock materials to be placed in the WRDFs are presented in **Table 3.4-6**. A ratio of ANP/AGP of 3:1 (or greater) generally indicates that the material is unlikely to generate acid (USEPA 1994). The ANP/AGP of 3:1 criteria is sometimes used as a criteria for material used to encapsulate PAG waste rock. The average ANP/AGP ratio for all of the rock units tested ranged from 5:1 to 2,900:1. The average ANP of all samples tested was 160.2 kg/t, while the average AGP was 6.0 kg/t, for an average NNP of 154.2 kg/t and an ANP/AGP ratio of approximately 27:1 (***Schafer 2013***). Based on these results it is anticipated that the average ANP/AGP ratio for the non PAG shell would exceed the ANP/AGP 3:1 criteria.

The WRDFs are sited and designed to minimize the risk of impact to waters of the State. During operations, little if any flux of meteoric water is expected to occur within the WRDFs because of the dry nature of rock when it is initially placed and the dry climate at the site. Reclaimed landforms would promote long-term geomorphic stability. Additionally, closure practices have been recently implemented



Legend

- Mixed Waste Rock
- Non-Potentially Acid Generating (non-PAG) Waste Rock
- Growth Media Cover

Source: BDMV 2012.

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Figure 3.4-11

WRDF Schematic Cross-section Showing Encapsulation of Environmentally Adverse Waste Rock

at the BGMI facility that reduce or eliminate infiltration of water and oxygen (Zhan et al. 2006); these closure practices would be applied to the proposed project. This design, involves shaping the facility to a geomorphically stable configuration ***and*** placing a soil cover composed of Carlin and/or topsoil material. ***This cover material has been shown to have a*** high water holding capacity***, is suitable for establishing*** perennial vegetation***, which acts to reduce net infiltration and*** meet post-mining land use objectives.

Relationship to Adjacent Surface Water and Groundwater

The existing WRDF is within the headwaters of a small ephemeral tributary to upper Boulder Creek. The WRDF was constructed with a French drain to conduct any flows that occurred in the facility foundation. Small flows from the French drain are collected in a small pond (the BLM detention pond at AR36 and AR09 in **Figure 3.4-2**) that would not be covered by the waste rock material. Water quality data for this feature is reported in **Table 3.4-5** for Sites AR09 and AR36. During operations, storm water from the proposed WRDFs would be managed under a general permit issued by NDEP. Sediment releases would be minimized or eliminated using a variety of best management practices (Section 2.3.6.9, Storm Water Management Facilities).

The seep at AR-09 and the BLM pond have been in place for approximately 25 years and are represented by AR-36 (Figure 3.4-2) data. As such, they are part of the existing baseline conditions. Flow from the seep would be reduced by reclamation practices that would cover the existing waste rock pile and create a vegetative cover. The BLM pond would continue to be an evaporative feature as it has been historically, with saline flats at the upstream end. While current conditions are anticipated to continue into the future, ongoing monitoring and any needed responses implemented through agency interactions would address water quality in the AR-09/AR-36 system as necessary.

After mining cessation, the WRDFs would be covered with growth media. After reclaimed vegetation becomes established and drainage systems stabilize, any surface runoff (expected to be an infrequent occurrence based on climatic conditions, predictive modeling, and observation) is expected to be suitable for release to waters of the State without storm water controls. The vegetated slopes and channel network would minimize sediment movement.

Groundwater is located in carbonate rock, at a depth of more than 1,000 feet beneath the WRDF. Groundwater also occurs as discontinuous or localized perched systems in the Carlin Formation deposits and Paleozoic clastic units.

Water Movement During Mine Operations

While the net infiltration of water through a cover dictates the amount of meteoric water that may contact waste rock in the long term, the water content of waste rock also is an important short-term factor affecting potential water movement within the dump. Rock material contains little water when mined because it has an inherently low porosity and has been desaturated by mine dewatering. When rock is blasted, mined, hauled, and placed, its void space and porosity increases from a few percent to 30 percent or more. Rock initially placed in the WRDFs would have approximately 2 to 3 percent volumetric water content. The equilibrium water content of waste rock (the field capacity) is expected to range from 5 to 8 percent volumetric water content in coarse rock (***Schafer 2013***). Therefore, rock material would need to absorb from 2 to 6 percent water before appreciable water movement would occur. Consequently, during and immediately after operations, the waste rock would absorb any percolation of meteoric water until the field capacity is reached and noticeable drainage occurs. Toe seepage may be observed during the operational phase due to the potential preferential flow, snowmelt infiltration, and surface water runoff from the sloped area.

Water Movement in the Post-closure Period

The reclamation plan proposed for the West and East WRDFs specifies the amount and type of plant growth media to be placed over the graded facility, the slope angles to be achieved, and the seed mix to be used. Evaporation and transpiration by vegetation extracts water from near-surface layers, predominantly during warmer periods, leaving a moisture-depleted plant root zone by fall, which can store water. Available information indicates that a vegetated evapotranspiration cover (consisting of topsoil or Carlin material) can reduce infiltration of meteoric water to pre-mining levels that occur naturally (***Schafer 2013***).

The proposed operational waste rock management plan and cover design are critical elements in achieving satisfactory long-term environmental performance. The net alkaline character of waste rock, the relatively small volume of acid-generating material, and the selective handling program would further help protect waters of the State. The waste rock classification, segregation, and selective placement program are designed to reduce the occurrence of acid rock drainage and migration of soluble metals, and to prevent releases of surface runoff, ***and minimize the potential for acid generation or metals mobilization***. The reclamation and closure approach for the facility is to grade and cover waste rock to prevent contact between waste rock and surface runoff, to minimize seepage and infiltration of water, and to reduce the diffusive flux of oxygen into the facility after closure of the facility. Minimization of net infiltration into the WRDFs through use of ***evapotranspiration (ET)*** covers would provide an effective means of ***minimizing*** migration of interstitial water from the facility.

The final ET cover is projected to reduce the net infiltration rate to approximately 1 to 2 percent of annual precipitation (BDMV 2013). Using an estimated average annual precipitation rate of 10.7 inches for the project site, and an assumed long term net infiltration rate ranging from 1 to 2 percent of the average annual precipitation, the estimated long term (i.e. postclosure) range of flow from the West WRDF is 6.2 to 12.2 gpm; and from the East WRDF is 1.0 to 2.1 gpm. This long-term seepage from the WRDFs is not expected to impact the downgradient groundwater quality because of the site geochemical conditions as described in the WRMP (Schafer 2013) and summarized below:

- ***Excess of alkalinity in both the waste rock material stored in the WRDFs, and in the unconsolidated sediments and bedrock beneath the facilities that is available to neutralize acidity generated locally by pockets of mineralized rock material stored in the facilities;***
- ***Elevated concentrations of soluble metals (such as iron, aluminum, copper, cadmium and lead) will tend to precipitate in secondary minerals predicted to form under neutral to alkaline pH conditions along the flow path that commonly occur in carbonate rich rocks;***
- ***The bedrock materials beneath the WRDFs are oxidized, and iron is relatively abundant in virtually all rocks in the project area (Schafer 2013). Therefore, arsenic, antimony and mercury released into solution are likely to be immobilized by sorption onto iron oxyhydroxides minerals that occur along the flow path.***

In addition, the groundwater elevation is currently over 1,000 feet beneath the surface footprint of the WRDFs as a result of extensive mine dewatering operations at the BGMI. After dewatering ceases, the groundwater elevation will eventually rebound to an elevation that will still be situated several hundred feet beneath the facility footprints. The low flow rates combined with the depth to groundwater indicates that 1) any seepage leaving the facility would experience relatively long travel times through the unsaturated zone prior to reaching groundwater, and 2) the long travel time would provide ample time for completion of slow neutralization and attenuation processes (Schafer 2013).

For these reasons, seepage from the WRDFs is not expected to result in a measurable change in downgradient groundwater quality that would exceed water quality standards for the anticipated beneficial uses (such as a potential source of drinking water).

Ore Stockpiles

The ore stockpiles would be designed and constructed to prevent potential degradation to surface or groundwater resources in accordance with Nevada mining regulations and in accordance with the NDEP water pollution control permit. The facilities would include an engineered liner system and a protective rock cover placed over the liner to prevent damage during ore dumping or excavation activities. Therefore, ore stockpiling activities are not expected to result in impacts to surface or groundwater resources.

Heap Leach and Other Process Facilities

Impacts to surface water quality from the heap leach and other process-related facilities would occur: 1) if process fluids, fuels, solvents, or other liquids were released to surface waters in sufficient quantities to exceed water quality standards or degrade beneficial uses; and 2) if runoff, erosion, or sedimentation were accelerated to a degree that degraded surface water flows or features.

Construction and Operation. Since the proposed project would be designed and operated as a zero-discharge facility in accordance with NDEP mining regulations, impacts from process fluids would be unlikely under anticipated construction and operating conditions. The heap leach and ancillary facilities would be constructed with geomembrane liners, lined ditches, and monitored leak detection/collection systems in compliance with NDEP design requirements. Plant facilities, storm water diversions, and solution and storm water event ponds also would be designed in accordance with regulations and interagency agreements. Compliance with interagency closure and reclamation requirements, including monitoring, would minimize the potential for long-term effects on surface water quality after cessation of proposed project operations. Based on these project commitments, no impacts to surface water quality are anticipated from process components under anticipated construction and operating conditions. Ore processing at the BGMI facility would be conducted under currently permitted authorizations. As a result no additional impacts to surface water quality are anticipated from ore processing at the existing BGMI process facilities.

Closure and Post Closure. The proposed strategy for reclamation and closure of the proposed heap leach pad is described in Section 2.3.8. In summary, the heap leach pad would be regraded to a slope of 3:1 and covered with a minimum of 24 inches of soil material derived from the Carlin Formation that would support vegetation. The cover material and vegetation would limit infiltration of water into the reclaimed facility by storing the infiltration water in the cover and removing moisture in the soil through evaporation and plant transpiration processes.

An important issue for closure of the heap leach facility is the management of effluent during draindown of the facility after mineral processing ceases and any residual flow that may occur in the post closure period. The performance of the existing heap leach pads was used to estimate the long-term infiltration rates from historic heap leach facilities that were previously reclaimed at the Dee Mine (Leach Pads No. 1-9, 10 and 11) and the AA Leach Pad at the nearby BGMI (BDMV 2013). The cover thickness, cover source material, and estimated net infiltration rate as a percentage of annual precipitation for each of these reclaimed leach pads is summarized in Table 3.4-13b.

Table 3.4-13b Historic Heap Leach Pad Infiltration Rate Estimates

Heap Leach Pad (Project)	*Cover Thickness (feet)*	*Cover Source Material*	*Estimated Net Infiltration Rate (% Annual Precipitation)*[1]
Heap Leach Pad No.1-9 (Dee Mine)	*1-10*	*Carlin Formation*	*2%*
Heap Leach Pad No. 10 (Dee Mine)	*1*	*Carlin Formation*	
Heap Leach Pad No. 11 (Dee Mine)	*1-2* *5*	*Carlin Formation* *Vinini Chert*	
AA Leach Pad BGMI	*4*	*Carlin Formation*	*0.63%*

[1]BDMV 2013

The Heap Leach Draindown Estimator (HLDE) spreadsheet model was calibrated to the estimated combined draindown flow rates from the Dee Mine Heap Leach Pads No. 1 to 11. The calibrated model used an assumed infiltration rate of 2 percent of the annual precipitation to simulate the observed flow from the Dee Mine Heap Leach Pads No. 1-11. Flow data from the BGMI AA Leach Pad indicates that the net infiltration through the reclaimed leach pad is approximately 0.63 percent of annual precipitation (BDMV 2013). The results of the spreadsheet modeling for the Dee Mine leach pads, and monitoring data for the BGMI AA Leach Pad substantiate the use of long term infiltration rates ranging from 0.6 to 2 percent of annual precipitation to estimate infiltration through similarly designed heap leach facilities.

The HLDE model was used to estimate the long-term flow rates from the proposed Heap Leach Pad No. 12. The calculation method, input parameter values, and results are presented in the spreadsheet model (BDMV 2013). The results of the analysis estimate average flow rates after 10, 20, and 30 years of draindown are 6.74 gpm, 4.56 gpm and 3.61 gpm, respectively for the proposed heap leach pad. These rates are based on an assumed infiltration rate of 1 percent of annual precipitation for the covered reclaimed facilities.

Water quality data for the Dee Mine heap leach pads No. 10 and 11 for the period of January 2006 and January 2011 is summarized in BDMV 2013. This water quality data set indicates that effluent from the leach pads has a pH ranging between 7 and 9; and TDS concentrations ranging between approximately 1000 to 3000 mg/l, with elevated sulfate concentrations. Nitrate is strongly elevated in the heap effluent resulting from the fact that nitrate is a decomposition product of cyanide oxidation. Detectible WAD cyanide also occurs in most samples of the effluent. Arsenic concentration in the effluent generally ranges from 0.1 to 0.2 mg/l, which is within the range of concentrations observed within the regional carbonate aquifer. These water data provides an indication of the likely range in concentrations that would be anticipated for the leachate generated during the closure period from the proposed Heap Leach Pad No. 12.

As described in Section 2.3.8.6, at closure, one or both of the storm water event ponds (and the process ponds, if necessary) would be converted to a long-term, post-closure fluid management facility consisting of ET-cells or evaporation basins. Prior to construction, a detailed engineering design would be submitted as part of the final closure plan for review by the NDEP and BLM prior to construction. The conceptual plan for the ET-cells or evaporation basins would include

leaving the pond liners in place and protected with a 2-foot over liner layer of earthen material and installing the required fluid distribution piping. The ponds would be backfilled with alluvial material to eliminate standing water (to prevent potential exposure to wildlife). It is anticipated the use of ET-cell or evaporation basin technologies would result in no discharge requiring treatment. Actual results would be monitored during the post-closure period and alternative use or treatment of the fluids would be developed if required. A final closure plan would be prepared and submitted to NDEP and BLM to provide for any detailed adjustments to the preliminary heap leach pad design to ensure adequate fluid management as required by regulations (NAC 445A.430 through 445A.447) and described in Section 2.3.8. The proposed conceptual design of the ET cells and evaporation basins and procedures for management of leachate generated from the proposed heap leach pad facility in the closure and post-closure period would prevent the solution from infiltrating to the groundwater system or impacting surface water resources. Therefore, closure of the heap leach facility is not expected to impact water resources.

Storm Water Management

Storm water would be managed under the proposed project in accordance with the Nevada General Storm Water Permit NVR300000 and the site Storm Water Pollution Prevention Plan (SWPPP). BMPs would be applied to route or control runoff and would reduce potential impacts from accelerated erosion and sedimentation. Storm water BMPs are discussed in Chapter 2.0, Section 2.3.6.9, Storm Water Management Facilities. Accepted engineering practices would be used to design and apply storm water controls such as diversion ditches, sediment traps, rock and gravel covers, or other applications. Concurrent reclamation and long-term reclamation practices (Chapter 2.0) would help reduce erosion and sedimentation from proposed project components.

Although potential impacts would be avoided or reduced under anticipated construction and operating conditions by compliance with agency programs and proposed measures, extreme weather events may create bypass conditions or unforeseen impacts. Severe (high intensity) storms, rapid snowmelt, or rain-on-snow events have the potential to damage operating or reclaimed project components. This has been known to occur at other mining sites in the region (BLM 2008b). Resulting adverse effects may include degradation of waters of the State and delays in successful restoration of post-mining land uses.

Both WRDFs have comparatively small upgradient catchment areas. This would reduce the need for designed diversion structures along their upgradient perimeters. Similar conditions would exist at the proposed pit. Small storm water control basins would be constructed upgradient of these components. Approximately 80 acres would drain to the basin near the proposed pit in Section 34. Approximately 160 acres would drain to the easternmost constructed storm water basin at the West WRDF in Section 27, and approximately 40 acres would drain to the constructed basin in the southeast corner of Section 28. Given the upgradient locations, proposed waste rock management plan (***Schafer 2013***), and proposed evapotranspiration cover on the WRDFs, acid rock drainage accumulation is not likely to occur at these locations. Meteoric water and run-on would seasonally accumulate in the storm water basins. Evaporation of that water may elevate the concentrations of TDS and other constituents, notably arsenic, which was identified in MWMP test results described previously in Section 3.4.1.4, Rock Geochemistry, and in Appendix A of the PoO. While such water would be isolated within the small, immediate watersheds, adverse water quality conditions may occur on a seasonal basis.

Haul Road Improvements

As stated in the SWPPP, road surfaces would be sloped gently toward ditches running the length of the roads. These ditches would have stabilized cut-outs or culverts and energy dissipation features to distribute storm water flows and reduce flow velocities. Storm water routed from roads would ultimately lead to sediment basins (as needed), open pits, or natural drainages.

As described in Chapter 2.0, Section 2.3.5.2, Bootstrap Haul Road, the Bootstrap Haul Road currently crosses Boulder Creek and Bell Creek via an earth-fill roadway that incorporates a series of culverts.

Under the Proposed Action, the culverts would be extended to accommodate additional road width. Accelerated erosion, sedimentation, and runoff water quality would be controlled by storm water BMPs used along the road as discussed in Chapter 2, Section 2.3.6.9, Storm Water Management Facilities, and in Appendix D of the Plan of Operations ("Stormwater Pollution Prevention Plan and Stormwater Monitoring Plan").

Water or approved dust suppressants such as magnesium chloride, calcium chloride, or lignin-sulfate would be used to minimize fugitive dust on the road. Dust suppressants would be sprayed in a manner that only moistens the road surface and minimizes run-off into adjacent areas. Dust suppressants would only be applied within the bermed road area. Similar to the existing road drainage features, the widened Bootstrap Haul Road would employ culvert crossings and berms, ditches and ditch outlets, relief culverts, armoring and energy dissipation, and other erosion control practices to control runoff and sedimentation from the road surface.

On the basis of these provisions, incremental water quality impacts to Boulder or Bell creeks are not anticipated to be noticeable from the Bootstrap Haul Road modification and maintenance.

3.4.2.2 Single Waste Rock Disposal Facility Alternative

Under the Single WRDF Alternative, the East WRDF would not be constructed. The Single WRDF alternative would eliminate direct impacts to a small ephemeral watershed area of approximately 197 acres that is tributary to Boulder Creek that would be located within the footprint of the East WRDF under the Proposed Action. As a result, any potential for seepage, or runoff, erosion and sedimentation impacts to Boulder Creek associated with the East WRDF would be avoided under this alternative.

Changes in contributing watershed areas under the Single WRDF Alternative would be similar to those described for the Proposed Action. The watershed area affected by the Single WRDF would represent approximately 0.3 percent of the Antelope Creek drainage and about 0.1 percent of the Rock Creek Valley (Hydrographic Basin 62). The absence of the East WRDF would allow runoff contributions from approximately 54 additional acres in the upper Boulder Creek watershed in comparison to the Proposed Action. Under existing conditions, approximately 513 acres of disturbance do not drain to the watershed. Under the Single WRDF Alternative, surface runoff from approximately 1,572 acres within the project area would be restricted from draining to upper Boulder Creek. These ephemeral headwater areas would comprise approximately 3.3 percent of the hydrologic study area, and approximately 0.44 percent of the Boulder Flat hydrographic basin.

Potential impacts to floodplains and flood hydrology from the Single WRDF Alternative would be minimal and similar to the Proposed Action. No federally delineated flood hazard zones have been identified within the proposed project area, and drainageways consist of narrow ephemeral streams.

The strategy for handling waste rock material is presented in the waste rock management plan submitted to BLM with the proposed PoO (***Schafer 2013***). A conceptual diagram of the environmental protection measures incorporated into the design of the West WRDF is shown in **Figure 3.4-11**. Since the geochemical characterization of the waste rock material, environmental protection measures incorporated into the design of the West WRDF, and closure and reclamation practices would be the same as the Proposed Action, the potential impacts to surface and groundwater would be similar to those previously described under the Proposed Action.

Storm water drainage ditches and small catchments would be constructed to manage runoff according to NDEP and BLM requirements. Meteoric water and run-on seasonally would accumulate in the storm water basins. Evaporation of that water may elevate the concentrations of TDS and other constituents, as discussed under the Proposed Action. Potential impacts associated with storm water basins would be similar to those under the Proposed Action for the West WRDF; potential impacts from the storm water basins on the East WRDF would be eliminated.

Impacts to springs, seeps, and ponds under this alternative would be the same as those described for the Proposed Action. All other project components in the Single WRDF Alternative are the same as those in the Proposed Action (including the open pit, heap leach facility, haul roads, process ponds, and ancillary facilities). Therefore, potential impacts to watershed areas and to streams, springs, and seeps and water rights associated with these project components would be the same as described under the Proposed Action.

3.4.2.3 Partial Pit Backfill Alternative

Under this alternative, impacts to surface water quantity and quality would be similar to those described for the Proposed Action. No perennial stream reaches would be disturbed, since none are located within the project area. Short reaches of unnamed ephemeral stream channels would be removed by project components. Similar to the Proposed Action, no springs would be removed, but seeps and/or wetlands would be removed as disturbance increases. Compliance with interagency requirements, including monitoring, would minimize the potential for long-term effects on surface water quality. Potential impacts from access roads and Heap Leach Pad No. 12 would be the same as those described for the Proposed Action.

Under the Partial Pit Backfill Alternative, the length of slopes on the West WRDF would be reduced and the area of the flatter crest surface would expand in comparison to the Proposed Action and the Single WRDF Alternative (see **Figure 2-18**). This would further reduce the potential for runoff and sedimentation from sideslopes at the West WRDF, but substantial surface water impacts from these source areas are not anticipated in general. Surface infiltration into the West WRDF would increase in comparison to the Proposed Action and the Single WRDF Alternative. The operational waste rock management plan would be the same as that implemented under the Proposed Action, however. Selective handling of waste rock, and the development of a vegetated soil cover over the waste rock, would still provide effective controls on the migration of interstitial water from the facility. This approach would avoid or reduce the potential impacts to waters of the state.

Under this alternative, the volume of East WRDF would be expanded in comparison to the Proposed Action, with corresponding substantial increases in slope lengths along the aspects draining to Boulder Creek. Under the Partial Pit Backfill Alternative, the expanded east-facing slopes would generally range from 1,500 to 2,000 feet long (see **Figure 2-18**). Although geomorphic drainage designs and storm water controls would be implemented, the potential for erosion, sedimentation, and related run off impacts to upper Boulder Creek would increase under the Partial Pit Backfill Alternative in comparison to the Proposed Action.

Changes in contributing watershed areas under the Partial Pit Backfill Alternative would be similar to those described for the Proposed Action. The watershed area affected by the West WRDF would represent approximately 0.3 percent of the Antelope Creek drainage and about 0.1 percent of the Rock Creek Valley (Hydrographic Basin 62). On the east side of the project area, the backfill configuration and the East WRDF would allow runoff contributions from approximately 145 additional acres in the upper Boulder Creek watershed when compared to the Proposed Action. Under existing conditions, approximately 513 acres of disturbance do not drain to the watershed. Under the Partial Pit Backfill Alternative, surface runoff from approximately 1,481 acres within the project area would be restricted from draining to upper Boulder Creek. These ephemeral headwater areas would comprise approximately 3.1 percent of the hydrologic study area, and approximately 0.41 percent of the Boulder Flat hydrographic basin.

Pit Lake Development

The same methodology described for the proposed project in Section 3.4.2.1, Proposed Action, was used to evaluate the pit lake development and geochemistry of the Partial Pit Backfill Alternative. The regional groundwater flow model was used to predict the development of the pit lake (JSA 2011). In contrast to the Proposed Action, the groundwater flow model simulations indicate that a single pit lake

would eventually develop in the North Pit (**Figure 3.4-12**). The placement of backfill within the south and east pit areas would preclude pit lake development within these areas.

The estimated surface area, volume and depth of the pit lake after full recovery are summarized in **Table 3.4-10**. The predicted lake development in the North Pit area is essentially the same as previously described for the North Pit area under the Proposed Action. However, due to the elimination of the pit lakes in the South and East Pits, the total area of final pit lakes would reduce from an estimated 89.1 acres under the Proposed Action, to 19.1 acres under the Partial Pit Backfill Alternative.

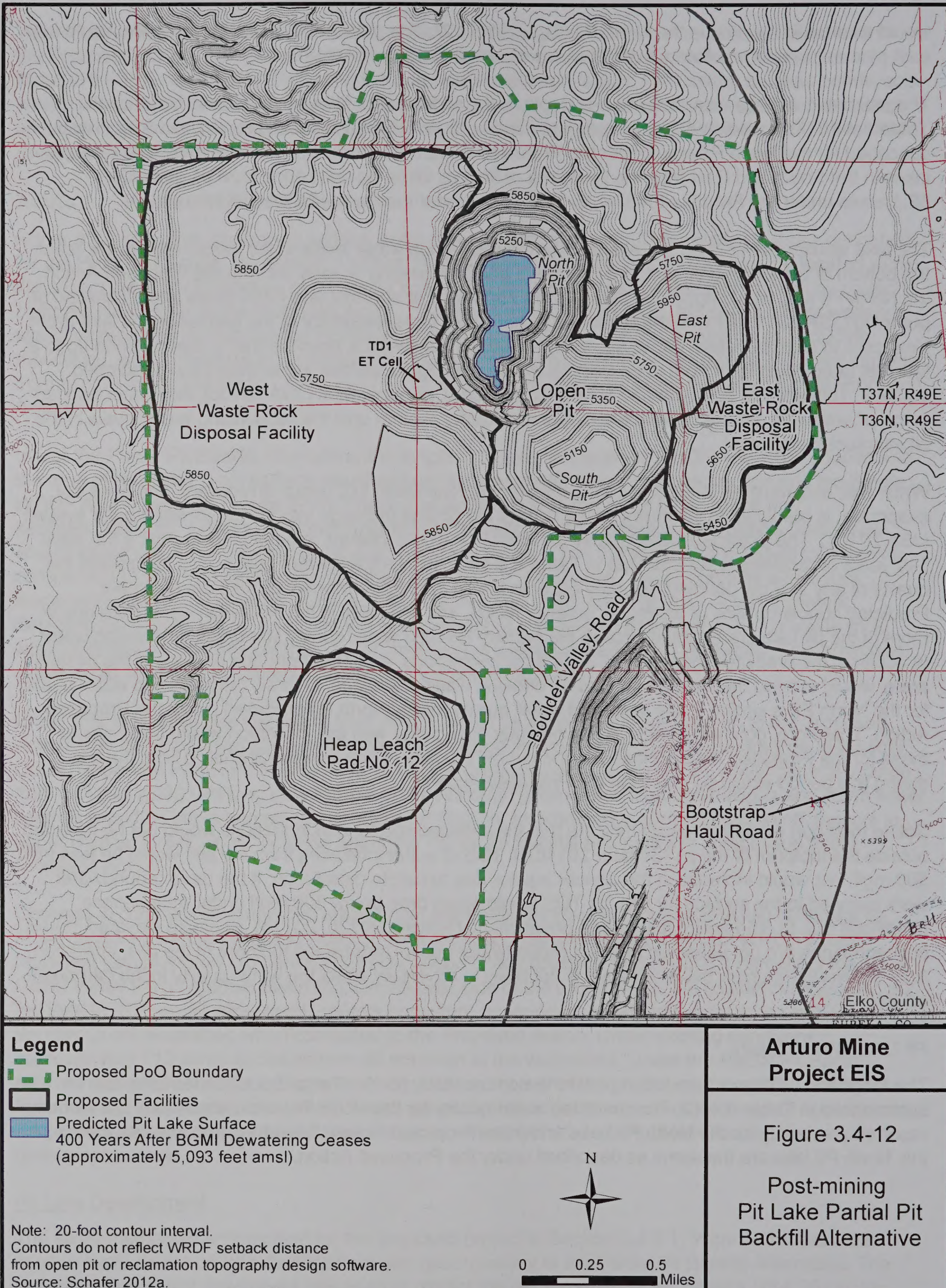
The lake would develop after the elevation of the recovering water levels in the carbonate aquifer reach the bottom of the existing pit at about 140 years after dewatering ceases. As with the Proposed Action, the North Pit lake would approach steady state conditions at approximately 400 years after cessation of pumping (JSA 2011). As with the Proposed Action, prior to development of the permanent pit lake (from Year zero to approximately 140 years after dewatering ceases) it is possible that a shallow pond up to a few feet deep could form from the collection of runoff and groundwater inflow from local or perched aquifers. This shallow pond may be perennial, seasonal, or ephemeral (JSA 2010c). Any water ponded in the pit would be perched above the carbonate aquifer system until the rebounding water levels in the pit intersect the pit shell.

Water that accumulates in the pits during the first approximately 140 years of recovery, and does not evaporate, is predicted to infiltrate into the floor of the pit and recharge into the carbonate aquifer system (JSA 2010c). The predicted water quality for water that would infiltrate into the pit floor during the initial 140 years of recovery is summarized in **Table 3.4-14**. This predicted water quality also represents the quality of any shallow ponding that may occur in the pit prior to permanent pit lake development. Predicted concentrations of antimony, arsenic, nickel, and selenium in the infiltration water from one or more of the pit lake areas would exceed the primary Nevada water quality standards for drinking water. In addition, the predicted manganese, sulfate concentrations, and TDS from one or more of the pit lake areas would exceed the Nevada secondary drinking water standards. Overall, the predicted water quality for the North Pit is similar to the predicted water quality for the North Pit predicted under the Proposed Action. Therefore, potential effects to groundwater associated with this infiltration would be similar to those for the Proposed Action. However, the overall quantity of groundwater recharge from the pits during this period would be less than the Proposed Action.

Solute transport modeling results indicate that the elevated metals concentrations would not be detected outside the footprint of the pit (Schafer 2011c,d). TDS of water infiltrating from the pits would be less than 500 mg/l, but would increase in the deeper aquifer due to calcite dissolution. If the deep groundwater were pumped to the surface for use, its TDS would again drop below 500 mg/l under atmospheric conditions due to off-gassing and calcite precipitation (Schafer 2012b, 2011b). Because elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits, infiltration from the North Pit under this alternative is not likely to adversely affect the water quality in the carbonate aquifer.

Pit Lake Water Quality

The long-term (400-year) predicted pit lake water chemistry for the Partial Backfill Alternative is summarized in **Table 3.4-12**. The predicted water quality for the North Pit lake is essentially the same as reported previously for the North Pit Lake under the Proposed Action. Therefore, impacts associated with this North Pit lake are the same as described under the Proposed Action.



Arturo Mine Project EIS

Figure 3.4-12

Post-mining Pit Lake Partial Pit Backfill Alternative

8/21/2012

Table 3.4-14 Predicted Water Quality of Outflow from the Pit Prior to Permanent Development of a Permanent Pit Lake: Partial Pit Backfill Alternative

Constituent (mg/l)[1]	Applicable Nevada Drinking Water Standards[2]	Partial Backfill Alternative		
		Minimum	Maximum	Average
Aluminum	0.05[3] – 0.2[4]	<0.004	<0.008	<0.006
Antimony	0.006	**0.021**	**0.039**	**0.028**
Arsenic (total)	0.01	**0.034**	**0.113**	**0.070**
Barium	2.0	0.041	0.084	0.06
Boron	--	0.1	0.3	0.3
Cadmium	0.005	<0.002	<0.004	<0.003
Calcium	--	155.3	277.8	198.4
Chloride	250[3]; 400[4]	3.2	14.7	7.4
Chromium (total)	0.1	<0.0002	<0.0002	<0.0002
Copper	1.3[5]; 1.0[4]	0.008	0.012	0.01
Fluoride	2.0[3]; 4.0[4]	1.0	1.7	1.2
Iron	0.3[3]; 0.6[4]	0.000	0.001	0.001
Lead	0.015[5]	<0.001	<0.001	<0.001
Magnesium	125[3]; 150[4]	17.1	53.4	30.2
Manganese	0.05[3]; 0.1[4]	0.057	**0.419**	**0.135**
Mercury	0.002	< 0.0003	< 0.0005	< 0.0004
Nickel	0.1	0.055	**0.175**	0.099
Nitrate (as N)	10	0.1	0.5	0.3
pH (standard units)	6.5 – 8.5[4]	6.90	6.97	6.94
Potassium	--	5.7	11.6	7.2
Selenium	0.05	0.011	**0.118**	0.033
Silver	0.1[4]	<0.001	<0.002	<0.001
Sodium	--	8.5	43.6	18.3
Sulfate	250[3]; 500[4]	139.0	**539.2**	277.3
Thallium	0.002	0.000	0.008	0.002
Bicarbonate	--	446	488.7	470.7
TDS	500[3]; 1,000[4]	780	**1,437**	**1,015**
Zinc	5.0[4]	0.79	1.95	1.25

[1] Units are mg/l unless otherwise noted.
[2] Nevada primary MCLs unless otherwise noted.
[3] Federal secondary MCLs.
[4] Nevada secondary MCLs.
[5] Value is action level for treatment technique for lead and copper.
Note: Bold values exceed Nevada Drinking Water Standards.
Source: Schafer 2011c.

Groundwater Flow Through Backfilled Pits

As with the proposed WRDFs, the waste rock backfilled into the South and East Pits would be graded to a geomorphically stable configuration and then covered with soil material composed of Carlin and/or topsoil that incorporates high water holding capacity and establishment of perennial vegetation. The reclamation is designed to eliminate contact between the waste rock and runoff; minimize infiltration through the waste rock; and reduce the flux of oxygen into the facility. The reclamation and waste rock ET cover would result in a reduction in the total amount of infiltration through the pits compared to the Proposed Action (Schafer 2011c).

In the post-mining period, groundwater levels in the carbonate aquifer will eventually rise above the buried floor of the pit and flood a portion of the backfilled waste rock material placed in the pit. The numerical groundwater flow predictions indicate that groundwater would initially encounter the backfilled waste rock at approximately 100 years after mine dewatering ceases at the BGMI facility. By approximately year 140 (after mine dewatering ceases) the groundwater flow gradient from the backfilled waste in the pits is towards the North Pit. Groundwater that comes into contact with the waste rock is expected to have a neutral pH, elevated TDS and metals concentrations similar to the water quality estimated to infiltrate the floor of the pit prior to pit lake development described above. However, development of the hydraulic sink in the North Pit is expected to essentially capture the groundwater that has interacted with the waste rock. As a result, the chemical load contained in water contacting backfilled waste rock in the South and East Pits is expected to be drawn into the pit lake that develops in the North Pit (Schafer 2011c). The contribution of this chemical load is not expected to substantially change the predicted water quality of the pit lake because of the similarity between the anticipated chemistry of the water contacting the waste rock and the predicted pit lake water quality and the relatively small proportion of ground water that would flow through the waste rock prior to reaching the North Pit (Schafer 2011c).

3.4.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and the related potential impacts to water resources would not occur. Continuation of mining activities associated with the Storm Underground Mine, completion of closure and reclamation activities associated with existing disturbance, and ongoing mineral exploration activities within the study area would be conducted under existing authorizations. No additional ground-disturbing activities beyond those currently authorized would occur at the mine site.

<u>Water Quantity Impacts</u>

Impacts to Water Levels

After dewatering ceases at the BGMI facility, the groundwater levels in the carbonate aquifer would eventually rise above the bottom of the pit and result in the development of a pit lake. The development and predicted water quality of the pit lakes is discussed under the "Pit Lake Water Quality" section below.

Impacts to Streams, Springs, and Seeps and Water Rights

Under the No Action Alternative, no impacts to perennial streams, springs, seeps would occur. In addition, impacts to the water rights identified in **Table 3.4-9** are not anticipated.

<u>Pit Lake Development</u>

Under the No Action Alternative, the existing Dee open pit would remain in its present configuration. The same methodology described for the proposed project in Section 3.4.2.1, Proposed Action, was used to evaluate the pit lake development and geochemistry of the No Action Alternative. The regional groundwater flow model was used to predict the development of the pit lake, as described in JSA (2010c). The flow modeling predicts that a shallow pond up to a few feet deep would initially form

from the collection of runoff and groundwater inflow from local or perched aquifers. This shallow pond may be perennial, seasonal, or ephemeral (JSA 2010c). Any water ponded in the pit would be perched above the carbonate aquifer system during an estimated 330 years of recovery. The elevation of the recovering water levels in the carbonate aquifer is predicted to reach the bottom of the existing pit at about 330 years after dewatering ceases. At this time, flow from the carbonate aquifer into the pit would result in the development of a permanent pit lake. The pit lake would approach steady state conditions at approximately 400 years after cessation of pumping.

The final pit lake area under the No Action Alternative is illustrated in **Figure 3.4-13**; predicted surface area, volume, and depth of the pit lake are summarized in **Table 3.4-10**. Under this scenario, a single (small) pit lake would develop with a surface area of approximately 0.6 acre. An estimated 95 percent of the net inflow to the pit lake (8.6 gpm) would come from highwall runoff and the remainder from direct rainfall. Most of the water in the existing Dee open pit (approximately 80 percent) would infiltrate into the carbonate aquifer, and the remainder would evaporate.

Rocks exposed in the existing Dee open pit include the Carlin Formation; oxidized Vinini Formation; and oxidized and unoxidized Rodeo Creek and Bootstrap Formation (**Table 3.4-8**). The rocks exposed in the existing pit surface have an average NNP of 146 kilogram per liter with 1.8 percent of the exposed rock classified as PAG.

Pit Water Infiltrating to Groundwater

Prior to development of the permanent pit lake, most of the precipitation and runoff into the pit would infiltrate into the floor of the pit and eventually contribute to flow in the carbonate aquifer. The estimated average infiltration rate during this period is 12 afy (7.5 gpm).

The predicted water chemistry of the infiltrated pit water is summarized in **Table 3.4-11**. The predicted concentrations of arsenic, nickel, and selenium in the infiltration water exceed the primary Nevada water quality standards for drinking water. In addition, the predicted maximum and average concentration of manganese, and maximum concentration of sulfate and TDS, exceed the Nevada secondary drinking water standards. The predicted average concentrations of antimony and arsenic over the infiltration period are similar to the average background water quality for the regional carbonate aquifer, while the concentrations of selenium and manganese are greater than background concentration in the carbonate aquifer.

As described for the Proposed Action, attenuation batch testing and numerical modeling were conducted to assess the potential fate and transport of key metals and TDS that may infiltrate from the pit floors prior to development of a permanent pit lake controlled by recovery of the regional carbonate aquifer. Results of the batch testing indicate that the bedrock in the floor of the pit has the capacity to absorb and precipitate constituents of concern and inhibit migration (Geomega 2011; Schafer 2011b). Solute transport modeling conducted to simulate sorption along potential flow paths between the pit bottom and the groundwater aquifer indicate that the elevated metals concentrations would not be detected outside the footprint area of the pit. TDS of water infiltrating from the pits would be less than 500 mg/l, but would increase in the deeper aquifer due to calcite dissolution. If the deep groundwater were pumped to the surface for use, its TDS would again drop below 500 mg/l under atmospheric conditions due to off-gassing and calcite precipitation (Schafer 2011b). Because elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits infiltration from the pits is not likely to adversely affect the carbonate aquifer.

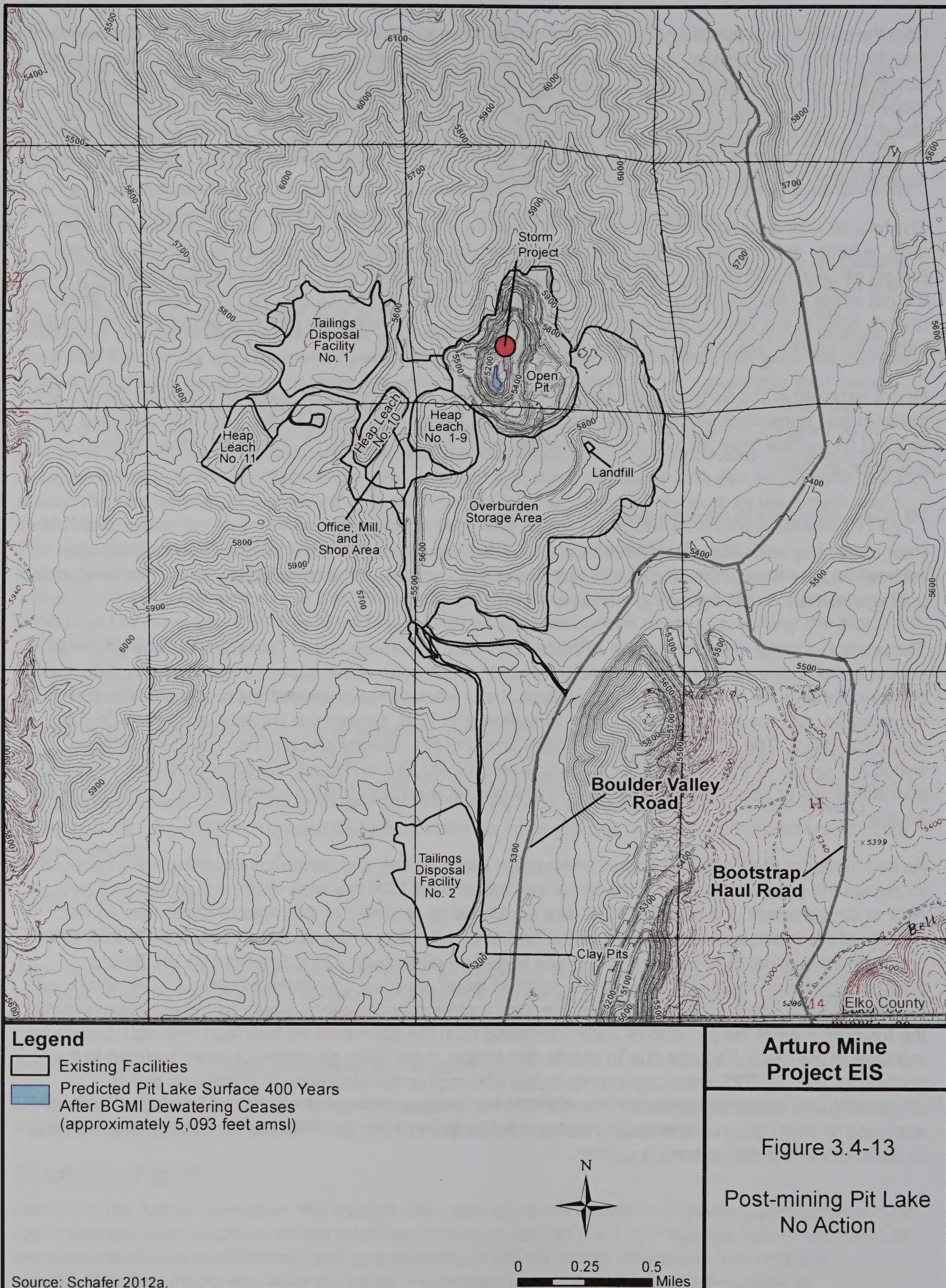


Figure 3.4-13

Post-mining Pit Lake No Action

8/21/2012

Pit Lake Water Quality

Accumulated water in the existing pit (No Action Alternative) is predicted to have a near neutral pH, as shown in **Figure 3.4-9** over the entire 400-year simulation period. The initial TDS is predicted to be approximately 1,400 mg/l, and gradually decrease over time as the highwall is rinsed by meteoric water, eventually dropping to approximately 100 mg/l after 300 years (**Figure 3.4-10**). Water would be calcium-sulfate type water initially but would transition to calcium-bicarbonate water as highwall rinsing progresses.

The predicted pit lake water chemistry for the existing pit after 400 years is summarized in **Table 3.4-12**. The predicted pit lake water constituent concentrations exceed the Nevada water quality standards for antimony and arsenic. Unlike the proposed project pit lake, the No Action pit lake is not predicted to behave as a groundwater sink. At 400 years, the pit lake is predicted to have outflow to the carbonate aquifer system at a rate of approximately 10 afy (6 gpm). Although the predicted concentrations of arsenic (0.037 mg/l) and antimony (0.041 mg/l) exceed the Nevada drinking water standards, these predicted concentrations are similar to the average concentrations for antimony (0.035 mg/l), and arsenic (0.021 mg/l) that occur in the carbonate aquifer, and are within the range of concentration (antimony 0.022 to 0.055 mg/l; arsenic 0.008 to 0.451 mg/l) in the carbonate aquifer. Therefore, pit lake outflow is not expected to adversely affect the water quality of the downgradient aquifer system. The potential risk to wildlife associated with exposure to the pit lakes is addressed in Section 3.17, Wildlife and Aquatic Biological Resources.

Surface Water Quality

Under the No Action Alternative, there would be no direct or indirect incremental impacts to surface water quality.

3.4.3 Cumulative Impacts

The CESA for water resources is defined in Section 3.4.1, Affected Environment, and is shown in **Figure 3.4-1**. The past, present, and reasonably foreseeable future actions (RFFAs) are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs from mining activities are identified in **Table 3.2-1**; their locations are shown in **Figures 3.2-1** and **3.2-2**.

3.4.3.1 Proposed Action

<u>Surface Water Resources</u>

Cumulative effects on surface water resources result from mine dewatering and discharge, runoff or seepage from mine components, from removal of surface water features within project footprints, from road or pipeline construction and maintenance, or from wildfire and livestock grazing.

Surface Water Quantity and Quality Effects from Mining

Mining projects within the CESA include those depicted north of the Humboldt River in **Figure 3.2-2**. Approximately 31,360 acres of past and present surface disturbance for mining and exploration actions are located in the water resources CESA. This represents approximately 2.3 percent of the 2,105 square mile CESA. Approval of the Proposed Action would add approximately 2,774 acres of disturbance within the CESA for a total of 34,134 acres, a 9 percent increase over the total past, present, and RFFAs within the CESA. Including this additional acreage, mining and exploration disturbance in the CESA would represent approximately 2.5 percent of the land area.

Major streams in the CESA include the Humboldt River; Rock Creek and its tributaries including Willow Creek, Antelope Creek, and Boulder Creek; Marys Creek; Maggie Creek; and Susie Creek (**Figure 3.4-3**). Perennial or discontinuously flowing stream reaches along these waterbodies would not be adversely affected by direct or cumulative impacts from the Proposed Action.

Runoff from small ephemeral tributaries would be reduced in the upper Boulder Creek drainage and elsewhere, due to expanding mine disturbance in the CESA. The Proposed Action would reduce contributing watershed acreage in the Boulder Creek drainage by approximately 1,626 acres. This reduction would represent approximately 0.45 percent of the 560 square miles of watershed in Boulder Flat (Hydrographic Basin 61), and approximately 0.12 percent of the CESA. In the Antelope Creek drainage, runoff from the Proposed Action would affect approximately 0.3 percent of that drainage, and about 0.1 percent of the Rock Creek Valley hydrographic basin.

The major effect of these reduced contributing areas would include a slight reduction of ephemeral flows from snowmelt and rainfall runoff in the CESA. These flows mostly occur in spring. Smaller flow rates and/or shorter flow durations may allow sediment build-up in affected tributary channels, and would reduce shallow groundwater availability in nearby alluvial deposits. Reduced recharge and soil moisture may adversely affect riparian systems. In parts of some streams such as Boulder Creek, lower Maggie Creek, lower Marys Creek, lower Susie Creek, and Antelope Creek, flow reductions could occur from mine-induced groundwater drawdown (BLM 2000b). Within the CESA, reduced ephemeral surface flow contributions would add to these impacts.

The Proposed Action would create disturbance in the Antelope Creek watershed in the northwestern part of the project area, within the Rock Creek Valley Hydrographic Basin. Runoff and seepage from the West WRDF would contribute to flow in small ephemeral tributaries of Antelope Creek. Direct flow impacts to Antelope Creek would be small, possibly unnoticeable, and would generate minor cumulative flow impacts on Antelope Creek.

Stream flows in Boulder Creek are ephemeral on Boulder Flat, and are generally removed from the channel by seepage and evapotranspiration. As discussed above in Section 3.4.1.2, Surface Water Resources, since there is no hydrologic connection of the Boulder Creek to the Rock Creek ditch or the Humboldt River there would be no cumulative surface water impacts from the proposed project.

In addition to these streamflow considerations, the Proposed Action would generate cumulative impacts to the overall number of springs and seeps. As described in previous NEPA documents (BLM 2008b, 2000b), approximately 130 springs and seeps were identified in the early 1990s in the Boulder, Bell, Brush, and Rodeo Creek drainages near the BGMI facility. Approximately 280 additional springs and 210 additional seeps were identified in the Willow Creek, Rock Creek, and Antelope Creek drainages. In the region around Newmont's Gold Quarry operations, 200 springs and seeps were identified. These features, identified from the earlier fieldwork and recent project-specific surveys, also are indicated in **Figure 3.4-3**.

Cumulative impacts to springs and seeps would occur within the CESA, since removal of these features would result from the Proposed Action. These impacts would add to existing and future impacts on springs and seeps, as described in other NEPA documents (BLM 2010a,b, 2008b, 2007a, 2000b). There are 67 identified spring sites located within the maximum extent of the 10-foot drawdown contour predicted by BGMI groundwater modeling (BLM 2003a). Flows from at least two of these springs that occur downstream along Boulder Creek have already ceased (AATA International 2006). These springs are the southernmost two indicated in **Figure 3.4-2**. Based on the analysis conducted in 2000, a total of 182 springs could be potentially impacted by mine dewatering in the Carlin Trend (BLM 2000b). However, recent assessments suggest that fewer springs/seeps could potentially be affected in the CESA overall (BLM 2010a,b, 2007a). In any case, the removal of springs and seeps during the Proposed Action would be an incremental addition to these impacts. Barrick and Newmont have existing obligations to mitigate mine dewatering effects on springs at selected locations in the CESA.

Cumulative surface water quality impacts could result from runoff and seepage from mining and exploration project components within the CESA. In general, these potential sources include leach pads, tailing ponds, mills and other process buildings, shops and warehouses, process fluid ditches and ponds, ore stockpiles, waste rock disposal facilities, drill pads and pits, and roads. The severity and extent of

these impacts would be reduced or mitigated by project design and construction, and by compliance with regulatory programs and associated permit stipulations. Examples of such controls include ditches, pipelines and containment features to manage runoff and process fluids; storm water pollution prevention programs; and spill prevention and response programs. With the exception of Newmont's Ivanhoe Open Pit Mine Project, water monitoring stations within the CESA have not reported elevated concentrations of metals or acid rock drainage (BLM 2010a,b). At Newmont's Ivanhoe Open Pit Mine Project, mine drainage issues are being addressed through waste rock stockpile treatments and a constructed wetland. In general, cumulative long-term mining impacts to surface water quality would be reduced by waste rock management, compliance with closure and reclamation permits and related agreements, and by the implementation of monitoring and mitigation measures.

Surface water quality impacts could result in the CESA from incidental spills, from intensive storms overwhelming control features and creating bypasses, and by erosion and sedimentation events at mining sites (e.g., ditch or slope failures). These isolated occurrences would affect surface water quality in their immediate locales. Operator and agency responses, in the form of containment and mitigation, would limit the extent and severity of these incidental impacts.

Pit lakes that ultimately form at Gold Quarry, Betze/Post, Arturo, and other sites in the CESA are not anticipated to discharge to surface waters. They are expected to be "sinks," where water is lost to evaporation (BLM 2008b). Based on modeling at the Betze-Post Pit, predicted concentrations of TDS, sulfate, flouride, arsenic, cadmium, nickel, and antimony are anticipated to exceed Nevada drinking water standards (BLM 2008b). The pH of Betze-Post pit lake water is anticipated to be near neutral in the long term, but there is a potential that it may be acidic in the short term (BLM 2008b). The long-term pit lake water quality under the Proposed Action would also exceed drinking water standards for several constituents. It should be noted, however, that based on restricted access, wildlife support is anticipated to be the only beneficial use of pit lake waters in the CESA. The potential cumulative risk to wildlife from exposure to pit lakes is addressed in Section 3.17, Wildlife and Aquatic Biological Resources.

Effects from Other Watershed Conditions

Other sources of surface water impacts in the CESA include existing conditions from grazing, irrigated croplands, wildland fires, and road construction and maintenance. These also contribute to existing surface water conditions of surface water flow and quality.

Grazing has been the most extensive historic land use in the CESA, and this is expected to continue. Surface water impacts from grazing are both beneficial and adverse. The contributions and impacts of grazing have long been debated (e.g., Elko County Nevada 2010; Northeastern Nevada Stewardship Group, Inc. 2003; Resource Concepts 2001; West 1983). In summary, both beneficial and adverse effects from grazing are widespread in the CESA. Among others, these effects include additional herbaceous growth and diversity, livestock trampling in riparian areas, and reduced overall vegetative cover.

Irrigated agricultural lands occupy a small portion of the CESA (Section 3.19, Land Use and Access). Impacts to surface water include flow diversions from streams and springs, consumptive use by crops, and increased concentrations of TDS and agricultural chemicals in irrigation return flows.

Wildfires in the CESA also have increased erosion and sedimentation, with attendant increases in turbidity and concentrations of suspended solids, dissolved solids, and temperature in area streams and ponds. Fire extent in the CESA is depicted in **Figure 3.2-3**. Most of the CESA has been burned, sometimes repeatedly, since the year 2000. From a watershed viewpoint, the most significant effect of these wildland fires is the loss of vegetation cover, which can lead to adverse changes in hillslope hydrologic function through decreased infiltration, increased runoff, and reduced soil quality (Pierson et al. 2011, 2003). These conditions then lead to increased flooding, accelerated erosion, increased turbidity and sedimentation and increased nutrient loading in surface water (National Wildfire

Coordinating Group 2001). Other effects of fire, and the potential for fire in the watersheds, are discussed in the vegetation and range management sections of the EIS.

Other disturbances in the CESA include the Ruby Pipeline, roads, and transmission lines. The Ruby Pipeline, a recently constructed natural gas pipeline, crosses about 28 miles of the Willow Creek Valley watershed. Assuming a disturbed width of 115 feet, approximately 390 acres were disturbed by the pipeline in the CESA. BMPs for backfilling, topsoil handling, revegetation, and erosion control would avoid or reduce runoff and erosion impacts from the proposed pipeline in the CESA.

The road network is extensive in the CESA. Potential cumulative impacts to runoff, erosion, and sedimentation are similar to those described for direct impacts. These existing effects include restricted drainage at road crossings of streams, modified drainage patterns, concentrated flow conditions that may accelerate erosion and sedimentation, sediment yielded from road maintenance, and water quality impacts from treatment chemicals (e.g., magnesium chloride) carried to nearby streams or riparian areas. These impacts affect streams such as Boulder Creek, Antelope Creek, Rock Creek, Willow Creek, Maggie Creek, Marys Creek, Susie Creek, and their tributaries. Generally the severity of these impacts diminishes with distance and increasing watershed area away from roads.

Groundwater Resources

The cumulative effects to water resources resulting from historic, present, and projected future dewatering activities for mines in the CESA were evaluated in detail in the CIA report for dewatering and water operations (BLM 2000b) and in the Betze Project, Draft Supplemental EIS (BLM 2000c). These impact evaluations used a calibrated numerical model to simulate the combined or cumulative hydrologic effects associated with dewatering and water management activities at existing and proposed mines.

Newmont Nevada Energy Investment, LLC (NNEI) operates the TS Power Plant in Boulder Valley. The power plant is a 242 MW coal-fired steam-turbine electric generation facility that commenced commercial power generation in June 2008. The design water requirement for the plant is approximately 2,400 gpm (the average water use since startup has averaged 1,400 gpm). The water required for the power plant is supplied from a primary production well located approximately 2 miles north of the plant site and two backup wells located closer to the plant. NNEI holds water rights to support TS Power Plant that allow a withdrawal rate of up to 5,565 gpm. The wells withdraw water from the alluvial basin fill aquifer in Boulder Valley. Depth to groundwater near the TS Power Plant varies from approximately 10 to 30 feet below surface. The alluvial water supply wells for the TS Power Plant operate outside of the area that is affected by drawdown associated with mine dewatering activities in the Carlin Trend. Therefore, water withdrawal for the TS Power Plant is unlikely to contribute to the cumulative drawdown associated with mine dewatering activities. Groundwater quality is acceptable for cooling water, which is the largest water use at TS Power Plant. NNEI maintains a potable water treatment system for arsenic removal and disinfection. Additionally, a reverse osmosis system with an associated ion exchange demineralizing circuit operated to produce boiler water (Laybourn 2012). Wastewater for the facility is discharged to four double-lined evaporation ponds managed in accordance to NDEP discharge permit requirements (NDWR 2011). Because the lined evaporative ponds are permitted as a zero-discharge facility, the TS Power Plant operation is not expected to impact surface or groundwater quality.

Expansion and deepening of the pit area would result in the development of three pit lakes, as discussed in Section 3.4.2.1, Proposed Action. The recently refined and recalibrated groundwater flow model (JSA 2010a) was used to evaluate the cumulative long-term effects of the pit lakes on the predicted maximum extent of drawdown. Specifically, this modeling evaluated the maximum extent of the 10-foot drawdown contour irrespective of time, as used in the earlier cumulative assessments. Cumulative results were generated for the No Action and Proposed Action pit lake scenarios. Comparison of the cumulative 10-foot drawdown for the No Action and Proposed Action scenarios indicated that the results are visually identical. The proposed project does not substantially change the predicted regional

drawdown pattern because the pit lakes would be a minor influence on the regional groundwater flow system (JSA 2010a).

As described under the proposed project (Section 3.4.2.1, Proposed Action), water accumulated in the pit would infiltrate to the carbonate aquifer during the first 200 years after dewatering ceases. After that time, the pit would behave as a sink with no outflow to groundwater. The estimated average infiltration rate over this period would range up to 90 gpm (total from all three pit areas). The predicted average concentrations of the water quality constituents over the infiltration period are predicted to exceed the background water quality for the carbonate aquifer, and exceed some Nevada drinking water standards. However, the results of solute transport modeling indicate that elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits, as summarized in Section 3.4.2.1, Proposed Action. Therefore, the Proposed Action is unlikely to contribute to cumulative impacts to groundwater quality.

3.4.3.2 Single Waste Rock Disposal Facility Alternative

Surface Water Resources

Cumulative impacts to surface water quantity and quality would be the same as those described for the Proposed Action.

Groundwater Resources

Potential cumulative impacts to groundwater resources under the Single WRDF Alternative would be essentially the same as those described for the Proposed Action.

3.4.3.3 Partial Backfill Alternative

Surface Water Resources

Cumulative impacts to surface water quantity and quality would be the same as those described for the Proposed Action.

Groundwater Resources

Potential cumulative impacts to groundwater resources under the Single WRDF Alternative would be essentially the same as those described for the Proposed Action.

3.4.3.4 No Action Alternative

Surface Water Resources

Under the No Action Alternative, no additional cumulative effects to surface water resources would occur. Cumulative effects to surface water quantity and quality would approximate those identified in previous NEPA assessments for the CESA (BLM 2010a,b, 2008b, 2007a, 2000b,c).

Groundwater Resources

After pit dewatering at the BGMI facility ceases the groundwater elevation in the carbonate aquifer would gradually rebound and eventually intercept the pit shell and form a permanent pit lake. The results of groundwater modeling indicate that this permanent pit lake would begin to develop 330 years after mining ceases. Prior to this time, water captured in the pit that does not evaporate would infiltrate into the carbonate aquifer. The estimated average infiltration rate during the first 330 years of water level recovery is 12 afy (7.5 gpm). The predicted average concentrations of the water quality constituents over the infiltration period are predicted to exceed the background water quality for the carbonate aquifer, and exceed some Nevada drinking water standards. Solute transport modeling indicates that elevated metals concentrations are not expected to affect groundwater quality outside the footprint of the pits. Therefore,

the No Action is unlikely to contribute to cumulative impacts to groundwater quality. Other cumulative impacts to groundwater resources would be the same as described under the Proposed Action.

3.4.4 Potential Monitoring and Mitigation Measures

Monitoring and mitigation measures for water resources and geochemistry are provided in the Final EIS, Appendix B, Monitoring and Mitigation Plan. These measures would apply to both the Proposed Action and the Single WRDF Alternative.

3.4.5 Residual Impacts

No residual impacts are anticipated for surface water resources. The existing streams are ephemeral and the contributing watershed areas are comparatively small and/or already disturbed. Control of process fluids and storm water would be required and monitored according to state and federal permits. The predicted infiltration of water from the pits that exceed some Nevada drinking water standards under both the Proposed Action and No Action alternatives is considered an unavoidable residual adverse impact to the local water quality of the carbonate aquifer.

Appendix B

Arturo Mine Project Monitoring and Mitigation Plan

Arturo Mine Project
Monitoring and Mitigation Plan

January 2014

List of Acronyms

AUM	animal unit month
BDMV	Barrick Dee Mining Venture
BLM	Bureau of Land Management
BVMP	Boulder Valley Monitoring Plan
CESA	Cumulative Effects Study Area
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Division of Wildlife
NEPA	National Environmental Policy Act
PPH	Preliminary Priority Habitat
Project	Arturo Mine Project
ROD	Record of Decision
WRDF	Waste Rock Disposal Facility
WWG	Wildlife Working Group

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1.0 Introduction

This Arturo Mine Project Monitoring and Mitigation Plan ("Plan") elaborates on the monitoring, mitigation, and conservation measures referenced in the resource sections of the Draft Environmental Impact Statement (Draft EIS) (BLM 2012) prepared for the Arturo Mine Project (Project). The monitoring and mitigation measures discussed in this Plan cover the range of impacts of the proposed Project. The Plan does not include monitoring or mitigation for impacts already addressed by the applicant-committed protection measures described in the Draft EIS. Additionally, the Plan does not specifically include monitoring and mitigation measures associated with required permit programs. Additional mitigation measures may be required upon review of monitoring results.

In response to comments received on the Draft EIS, and further evaluation, this Plan revises and provides additional detail for certain monitoring and mitigation measures that were described in the Draft EIS, and proposes certain additional monitoring and mitigation measures not originally included in the Draft EIS. Some contingent mitigation measures may require future permitting or National Environmental Policy Act (NEPA) analysis at the time of design and prior to implementation.

The following Bureau of Land Management (BLM) or State of Nevada plans are incorporated herein by reference: Weed Management Plan, Reclamation Plan, Waste Rock Management Plan, Stormwater Pollution Prevention Plan, Spill Contingency Plan, Water Pollution Control Permit Application, and Dust Control Plan.

The Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] §§ 1500 1508) for Implementing the Procedural Provisions of NEPA define mitigation (40 CFR §§ 1508.20) as follows:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree of magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or
- Compensating for the impact by replacing or providing substitute resources or environments.

2.0 Monitoring and Mitigation Measures

The following sections describe monitoring and mitigation measures associated with the environmental impacts identified in the Arturo Mine Project Draft EIS. The description of each monitoring and mitigation measure identifies the potential impact addressed by the measure, a description of the measure, and the measure's effectiveness. Note that specific contingent mitigation measures may require future permitting or NEPA analysis prior to implementation.

2.1 Water Resources and Geochemistry – Facility and Waste Rock Disposal Facility Monitoring

2.1.1 Potential Impact

Surface and groundwater monitoring for the Arturo Mine Project utilizes the monitoring required for Nevada state water pollution control permits. Details regarding the water pollution control permit's monitoring program are provided in Appendix B (Monitoring Plan) of the Arturo Mine Project Plan of

Operations and Reclamation Permit Application (Barrick Dee Mining Venture [BDMV] and SRK 2012). The following major Project facilities: West Waste Rock Disposal Facility (WRDF); East WRDF; Heap Leach Pad; and Process Ponds could impair surface and groundwater resources and impact public land.

2.1.2 Monitoring and Mitigation Measure SW-1

2.1.2.1 Monitoring

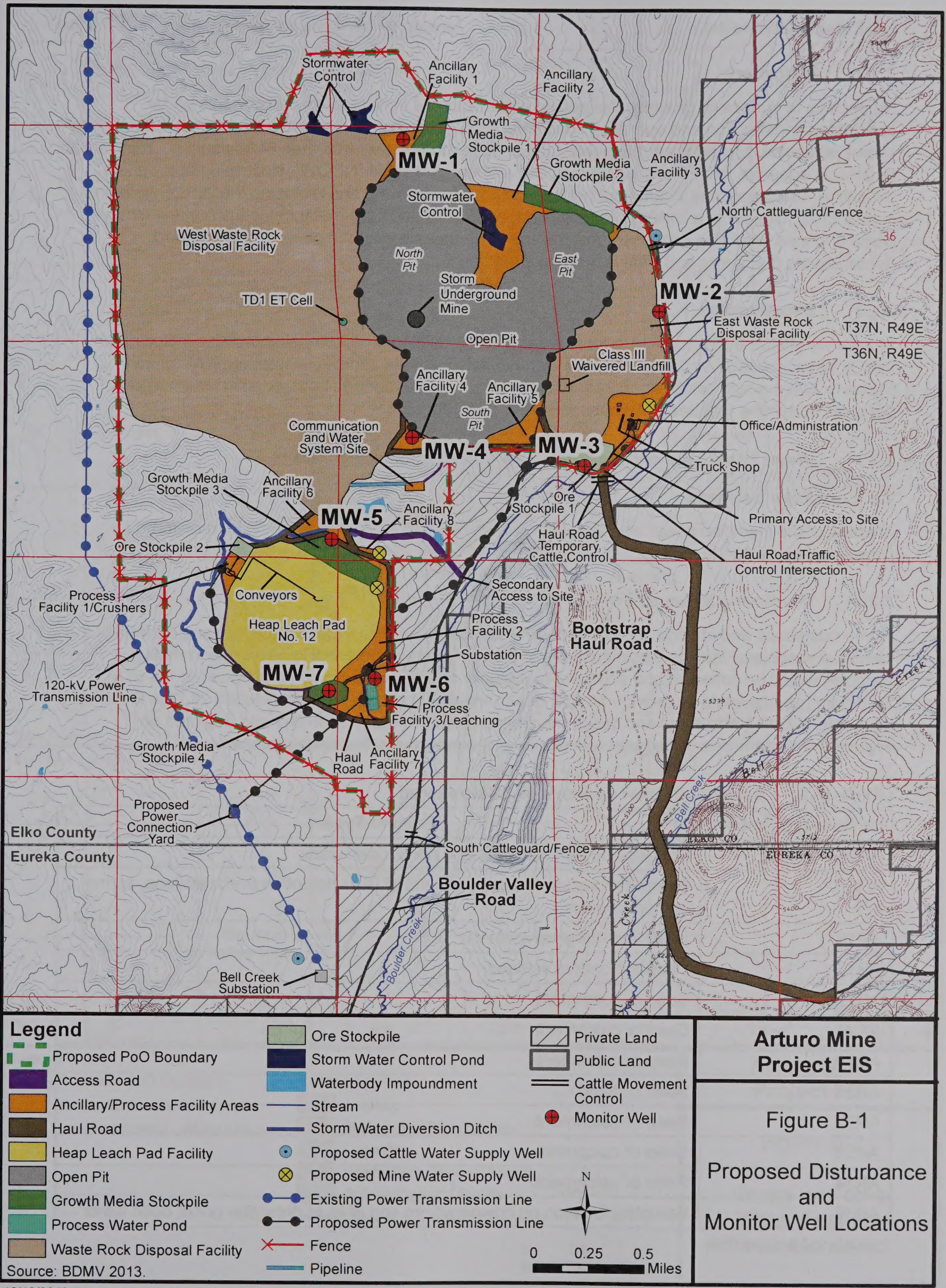
Surface water and shallow groundwater would be monitored to evaluate potential impacts of process facilities. Surface water would be monitored utilizing the methodology outlined in Arturo Mine Project Plan of Operations and Reclamation Permit Application (BDMV and SRK 2012) to determine if contaminants are leaking from process facilities.

Surface water quality monitoring specifically would include the seeps and other features outlined in the Section 2.2, Water Resources and Geochemistry – Seep and Spring Data, as well as the new location on Antelope Creek between existing Boulder Valley Monitoring Plan (BVMP) locations ANT-1 and ANT-2. The new Antelope Creek station would be placed to monitor surface water quality from the ephemeral drainages down-gradient of the WRDF.

Potential water quality impacts to groundwater would be monitored using seven shallow proposed monitoring wells (MW-1 through MW-7) down-gradient of each major process facility. **Figure B-1** shows the approximate locations of the monitor wells. These wells are situated to monitor impact of perched and shallow, discontinuous alluvium aquifers within the project area. These proposed sites are situated down-gradient from proposed major process facilities. Wells would be monitored for groundwater elevation and water samples analyzed for Nevada Division of Environmental Protection (NDEP) Profile I constituents.

Should results of chemical analysis of either surface water and/or groundwater samples be found to exceed Profile I criteria or localized groundwater baseline, then the following procedure would be implemented.

- The BDMV would verbally report results to the BLM and the NDEP within 3 working days of analyzing data and follow up with written verification.
- After verbal notification has been provided, the BDMV would institute accelerated (i.e. monthly sampling) of those monitoring sites which show preliminary indications of impacts.
- If, after 3 months, this accelerated monitoring program shows continued evidence of exceedances, BDMV would conduct a site investigation to determine the source and develop a plan to correct or remediate the source. Within 6 months of determination of an environmental impact, BDMV would provide a written report to the BLM and the NDEP which describes the source of the environmental impact and the proposed remediation. The mine plan would be amended if appropriate.
- BDMV would implement the remediation plan within 90 days after acceptance by the BLM and the NDEP and completion of any required NEPA. After the corrective measures have been implemented, BDMV would provide a report to the BLM and the NDEP within 60 days, documenting the measures which were taken to remediate the impacts. This report would include "as-built" drawings showing any substantial modifications to the facilities.



Arturo Mine Project EIS

Figure B-1

Proposed Disturbance and Monitor Well Locations

12/18/2013

2.1.2.2 Mitigation

No impacts to surface or groundwater quality are anticipated from process components under anticipated construction and operating conditions so no mitigation is proposed at this time. If monitoring shows otherwise, and an impact to public land or its resources occurred then BLM would coordinate with applicable agencies, NDEP and or Nevada Department of Wildlife (NDOW), to develop appropriate mitigation. Mitigation may include but not be restricted to removing and replacing the WRDF on better containment, closure of a leaking process pond, and pump and treat methodologies. At mine closure pump and treat would be continued until a water impermeable cap is in place and monitoring demonstrates that pump and treat is no longer needed.

2.1.3 Effectiveness

Monitoring Measure SW-1 would identify areas of potential seepage from mine facilities including any WRDF basal seepage and evaluate if the water quality exceeds applicable standards. Mitigation Measure SW-1 would establish approved methods to capture, control, treat, or otherwise mitigate seepage from mine facilities to address effects to water resources.

2.2 Water Resources and Geochemistry – Seep and Spring Data

2.2.1 Potential Issue

Thirteen of the identified seeps and springs exist in the Arturo Project area would be monitored for potential impacts due to mining.

2.2.2 Monitoring Measure SW-2

Numerous seeps and springs are situated within or near the Arturo Project boundary and thirteen of the identified seeps and springs would continue to be monitored for potential impacts due to mining. Samples would be collected and analyzed bi-annually and raw data would be provided to the BLM. Summary reports would be provided to the BLM annually. This data may be included into the BVMP at a later date. A listing of springs and seeps monitoring sites are listed **Table B-1** and depicted on **Figure B-2**. Parameters to be collected include pH, conductivity, and spring temperature.

Table B-1 Seeps and Other Features to be Monitored

Inventory Number	Feature Type
AR05 and 05a	Drainage bottom wetlands and pond, open water
AR09	Sampling location on upstream end of BLM detention pond; wetland, spring and open water
AR16	Seep and marginal wetlands
AR17	Drainage bottom wetland
AR22	Seep or catchment
AR24	Seep or catchment
AR26	Seep or catchment
AR27	Seep wetland
AR32	Seep or catchment
AR33	Seep or catchment
AR34	Seep or catchment
AR36	Sampling location on downgradient end of BLM detention pond; open water

Source: Cedar Creek 2009.

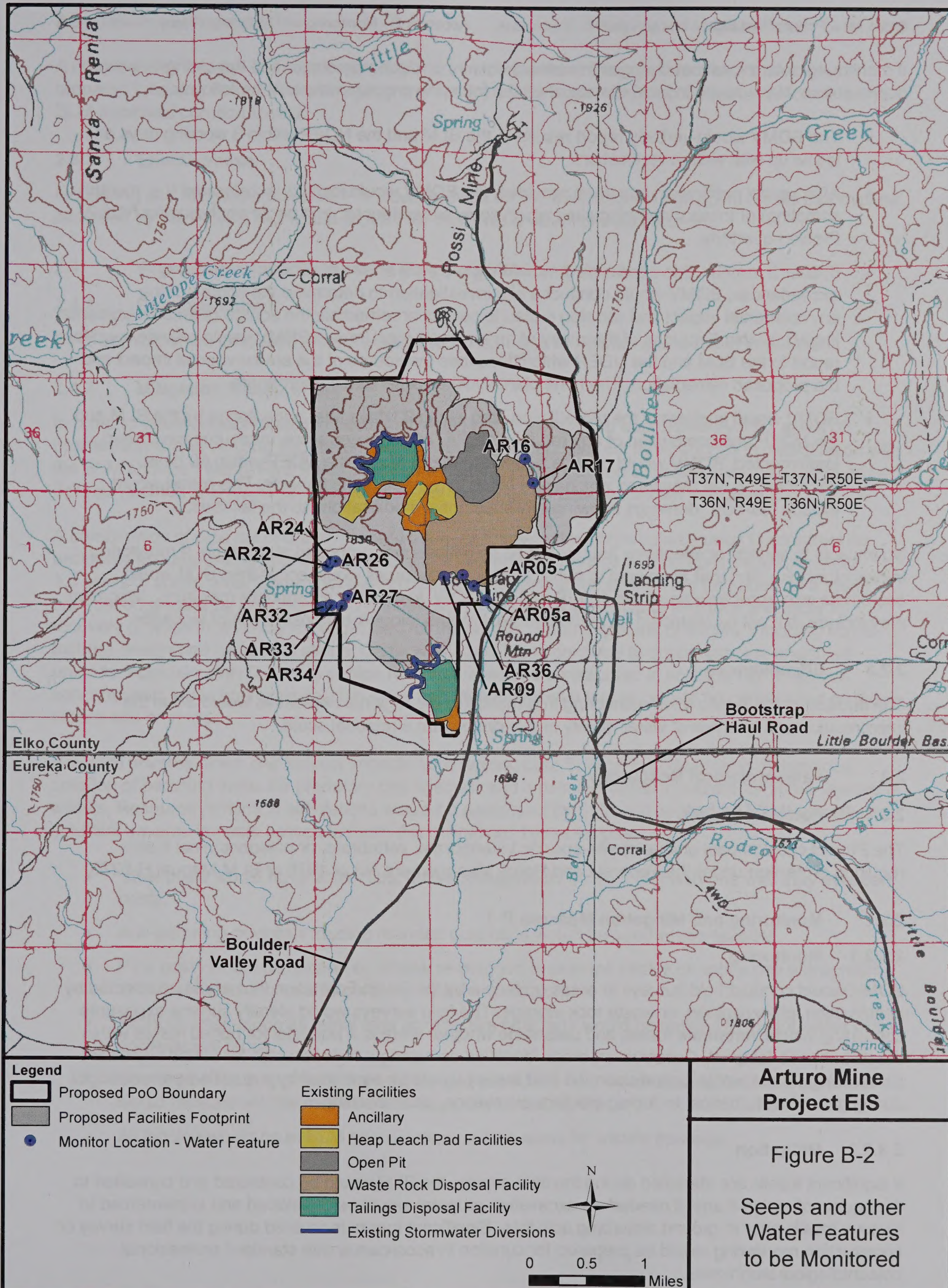


Figure B-2

Seeps and other Water Features to be Monitored

12/19/2013

If monitoring determines that changes in water chemistry or discharge occur, and the changes are not due to seasonal variations in local climate, then the following procedures would be followed:

- The BDMV would verbally report results to the BLM and the NDEP within 3 working days and follow up with written verification.
- After verbal notification has been provided, the BDMV would institute accelerated (i.e. monthly sampling) of those monitoring sites which show exceedances, and begin analyzing for NDEP Profile I quarterly.
- If, after 3 months, this accelerated monitoring program shows continued evidence of exceedances, BDMV would conduct a site investigation to determine the source of the environmental impact and develop a plan to correct or remediate the source of an environmental impact. Within 6 months of discovery of an environmental impact BDMV would provide a written report to the BLM and the NDEP which describes the source of the environmental impact and the proposed remediation. The mine plan would be amended if appropriate.
- BDMV would implement the remediation plan within 90 days after acceptance by the BLM and the NDEP and completion of any required NEPA. After the corrective measures have been implemented, BDMV would provide a report to the BLM and the NDEP within 60 days, documenting the measures which were taken to remediate the impacts. This report would include "as-built" drawings showing any substantial modifications to the facilities.

No impacts to springs or seeps are anticipated so no mitigation is proposed at this time. If monitoring shows otherwise, and that an impact to public land or its resources would occur then BLM would coordinate with applicable agencies, NDEP and/or NDOW, to develop appropriate mitigation. Mitigation may include, but not be restricted to, pump and treat methodologies or construction of wetlands.

2.2.3 Effectiveness

The addition of the Arturo Mine monitoring information to the regional databases would aid in the interpretation and analysis of water quality and hydrology on a regional scale.

2.3 Paleontological Resources

2.3.1 Potential Impact

The Project could impact unique or site-specific invertebrate, vertebrate, or paleobotanical fossils requiring protection under the Federal Land Policy Management Act of 1976 or BLM Manual H-8270.

2.3.2 Monitoring and Mitigation Measure P-1

2.3.2.1 Monitoring

BDMV would conduct field surveys in areas underlain by the Carlin Formation that would be affected by construction, pit expansion, or waste rock storage. The field surveys would identify surface exposures containing visible vertebrate fossils and determine whether there is a potential for buried fossils within the disturbance footprint. Construction areas identified as having a high potential for buried significant paleontological resources based upon the field survey would be evaluated by a qualified paleontologist during ground disturbance, including grading, excavation, and trenching.

2.3.2.2 Mitigation

If significant fossils are identified during the field survey, the BLM would be contacted and consulted to the course of action if any. If needed an excavation program would be developed and implemented to remove fossils prior to ground disturbing activities. Significant fossils recovered during the field survey or construction monitoring would be prepared for curation in accordance with standard professional paleontological techniques.

A report on the findings of the salvage program, including a list of the recovered fossils, would be prepared following completion of the program. A copy of this report would accompany the fossils to the BLM approved curation facility.

2.3.3 Effectiveness

Monitoring and Mitigation Measure P-1 would provide for the evaluation of significant fossils that may be disturbed by the Project and would provide for their preservation or data recovery.

2.4 Vegetation Including Riparian Zones and Wetland Areas

2.4.1 Potential Impact

Development of the proposed project would affect 1.63 acres of riparian and wetland vegetation.

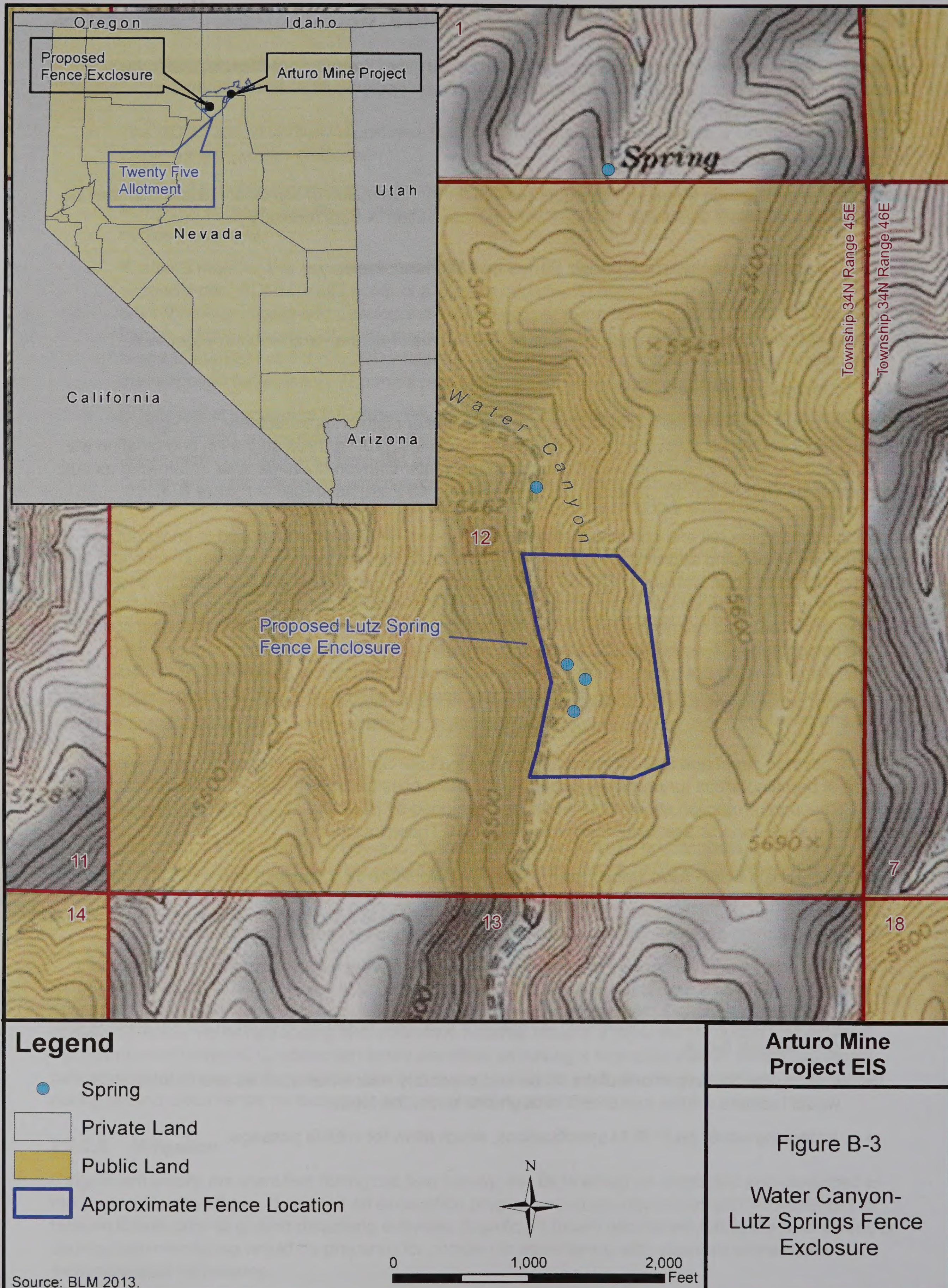
2.4.2 Mitigation Measure W-1

In order to offset project-related impacts that would remove or disturb approximately 1.63 acres of riparian zones and wetland vegetation, BDMV would fence and protect three springs in coordination with the BLM and the Twenty Five Ranch, located within the Water Canyon drainage area, referred to as Lutz Springs (located in Section 12, Township 34 North, Range 45 East) as shown in **Figure B-3**.

A combination of pipe rail and conventional three- or four-wire fencing would be used to construct an exclosure encompassing approximately 36 acres around Lutz Springs that comprise approximately 1.5 acres of spring area. Currently, riparian habitat conditions at the springs are degraded as a result of hot-season grazing by livestock on an annual basis. Fencing would exclude livestock and allow for recovery of wetland and riparian vegetation for the benefit of many species of wildlife, including some that are designated as special status. Cattle would be able to continue to graze adjacent ungrazed uplands. Approximately 0.4 miles of pipe rail fence would be constructed in areas of high livestock concentration, while approximately 0.6 miles of conventional wire fencing would be constructed on steep slopes and on ridges.

Potential adverse direct and indirect impacts from fencing Lutz Springs include ground disturbance, creation of perching areas for predatory bird species, and a possible collision hazard for some species of wildlife. Resource protection stipulations would be developed by BLM and applied by BDMV to reduce potential adverse impacts associated with this mitigation. These include:

- Steel posts would have white tops; post spacing would be 16.5 feet with one wire stay between posts.
- Anti-perching devices including rounded post caps would be used where feasible.
- Pipe posts would be capped or otherwise plugged to prevent wildlife or native bee entrapment and to serve as a barrier to perching by avian predators.
- Flight diverters such as metal tags or reflective type tags would be applied to the top wires of the conventional fence.
- Use of pipe rail on portions of the fence and especially near water sources and riparian areas would facilitate wildlife movement through and under the fence.
- All fencing would be to BLM specifications, which allow for wildlife passage.


Oregon
Idaho
Proposed Fence Exclosure
Arturo Mine Project
Twenty Five Allotment
Utah
Nevada
California
Arizona
Spring
Water Canyon
Proposed Lutz Spring Fence Enclosure
Township 34N Range 45E
Township 34N Range 46E
1
7
11
12
13
14
18
5549
5462
5690
5728
5400
5500
5600
Legend
Spring
Private Land
Public Land
Approximate Fence Location
N
0
1,000
2,000
Feet
Source: BLM 2013.
Arturo Mine Project EIS
Figure B-3
Water Canyon-Lutz Springs Fence Exclosure

12/18/2013

- Fencing would be placed such that any roads in the area are still passable by ranch vehicles.
- Standard procedures for minimizing disturbance and limiting opportunities for weed establishment would be followed. Any disturbed areas would be reseeded, as necessary.

The mitigation is consistent with sage-grouse conservation measures outlined in BLM instruction memorandums 2012-043 and 2012-044 and Western Association of Fish and Wildlife Agencies guidelines.

In March 2011, a Class III cultural resources inventory was conducted within the Lutz Springs area in Water Canyon to determine whether the installation of the fence would result in cultural impacts. The Class III inventory recorded three new prehistoric lithic scatter locations that are not eligible for the National Register of Historic Places.

2.4.3 Effectiveness

Fencing and protection of the Lutz Springs area along the Water Canyon drainage would limit livestock impacts to riparian areas and improve habitat condition and resiliency. Currently, these areas are highly degraded and are impacted by livestock in the form of trampling, soil compaction, and overuse of riparian plant species. Entrenched drainages channels also have drained historic meadow areas. As wetland/riparian plants begin to colonize exposed areas, problems with hummocking and localized channel cutting would decrease, while infiltration and water storage is expected to increase.

Improved ecological function of springs is expected to directly and indirectly benefit many species of wildlife including those considered special status. Species such as the greater sage-grouse, migratory birds, and many species of mammals are dependent on functioning riparian habitats during all or some parts of their life cycles. Fencing of springs in Water Canyon also would contribute to a positive cumulative impact of on-going efforts to improve riparian habitats in other parts of the Twenty Five Allotment.

2.5 Range Resources – Grazing Water Source

2.5.1 Potential Impact

The Project would reduce the amount of land available for grazing during construction, operation, and through the post-closure period.

2.5.2 Mitigation Measure R-1

BDMV would repair five pit reservoirs at the Water Canyon spring complex area by dredging sediment from the existing pit reservoirs to retain water runoff from nearby springs.

2.5.3 Effectiveness

Implementation of this mitigation measure would offset project-related impacts to grazing by improving an existing source of surface water for livestock within the project region.

2.6 Range Resources – Fence Modifications

2.6.1 Potential Impact

The installation of the project fence in combination with the existing Boulder Seeding Fence would result in suspension of 585 animal unit months (AUMs) from livestock grazing.

2.6.2 Mitigation Measure R-2

BDMV would implement modifications to the Boulder Seeding Fence as shown in **Figure B-4**. Portions of the Boulder Seeding Fence would be modified, with some sections added and some sections removed, in conjunction with the Project fence, in order to maximize available AUMs.

2.6.3 Effectiveness

Implementation of this mitigation measure would reduce the AUMs suspended by the Project activities to only those directly affected by the installation of the Project fence.

2.7 Wildlife and Aquatic Biological Resources – Riparian and Wetland Mitigation

2.7.1 Potential Impact

Development of the Project would affect approximately 1.63 acres of riparian and wetland habitat utilized by wildlife species.

2.7.2 Mitigation Measure WL-1

BDMV would install BLM-approved fencing around approximately 36 acres of wetland vegetation, including three springs, within the Water Canyon spring complex area, referred to as Lutz Springs, as described in Section 2.4.2, Mitigation Measure W-1 and shown in **Figure B-3**.

2.7.3 Effectiveness

Implementation of this mitigation measure would offset project-related impacts to wetland and riparian vegetation by preventing livestock use within the fenced Water Canyon spring complex and enhancing existing wetland habitat within the project region. The mitigation measure also would improve an existing source of surface water for wildlife within the project region.

2.8 Wildlife and Biological Resources – Mule Deer Migration

2.8.1 Potential Impact

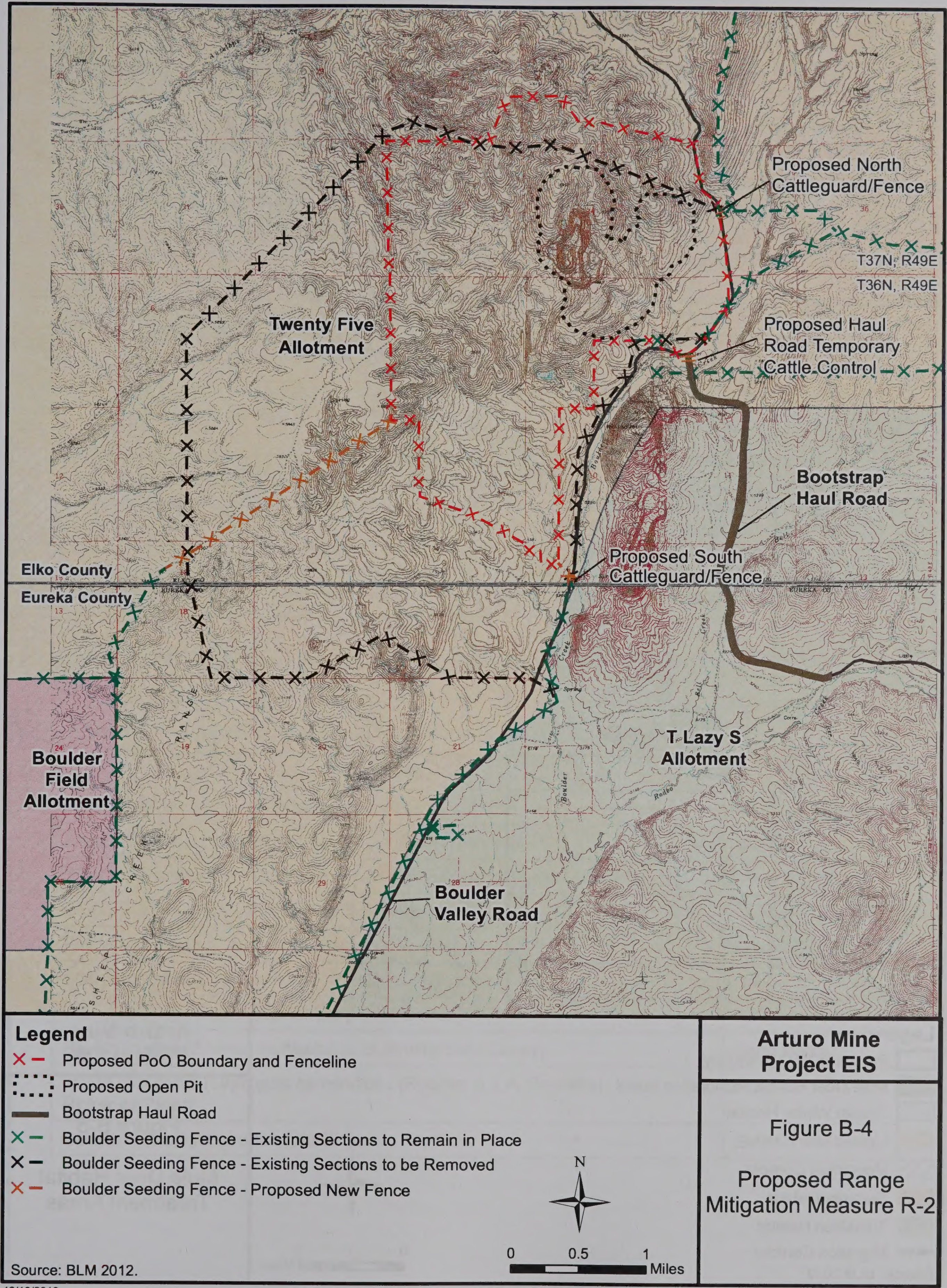
The EIS identifies impacts to 1,391 acres of Area 6 mule deer transitional habitat and a migration corridor. This additional loss of habitat adds to the stress on the Area 6 mule deer population due to existing large habitat loss in the crucial winter range southwest of the project area caused by wildfire. Migration corridors in the Carlin Trend have been modified by past and present mining operations. The implementation of the Project would further reduce habitat for migrating mule deer in the Carlin Trend.

The West Waste Rock Disposal Facility was redesigned to minimize impact to the mule deer migration corridor by scaling back the north side. This redesign is incorporated into the proposed action.

2.8.2 Monitoring and Mitigation Measure WL-2

2.8.2.1 Mitigation

In order to reduce project-related impacts that would remove or disturb 1,391 acres of sagebrush habitat for migrating mule deer between important summer and winter range, BDMV would restore crucial winter mule deer range located on BLM land immediately northwest of Boulder Valley along the southeast flank of the Sheep Creek Range at a ratio of 1:1, approximately 1,400 acres. The locations of possible restoration areas are shown on **Figure B-5**. Restoration activities that would be used to restore important winter mule deer range include, but are not limited to:



Arturo Mine Project EIS

Figure B-4

Proposed Range Mitigation Measure R-2

12/18/2013

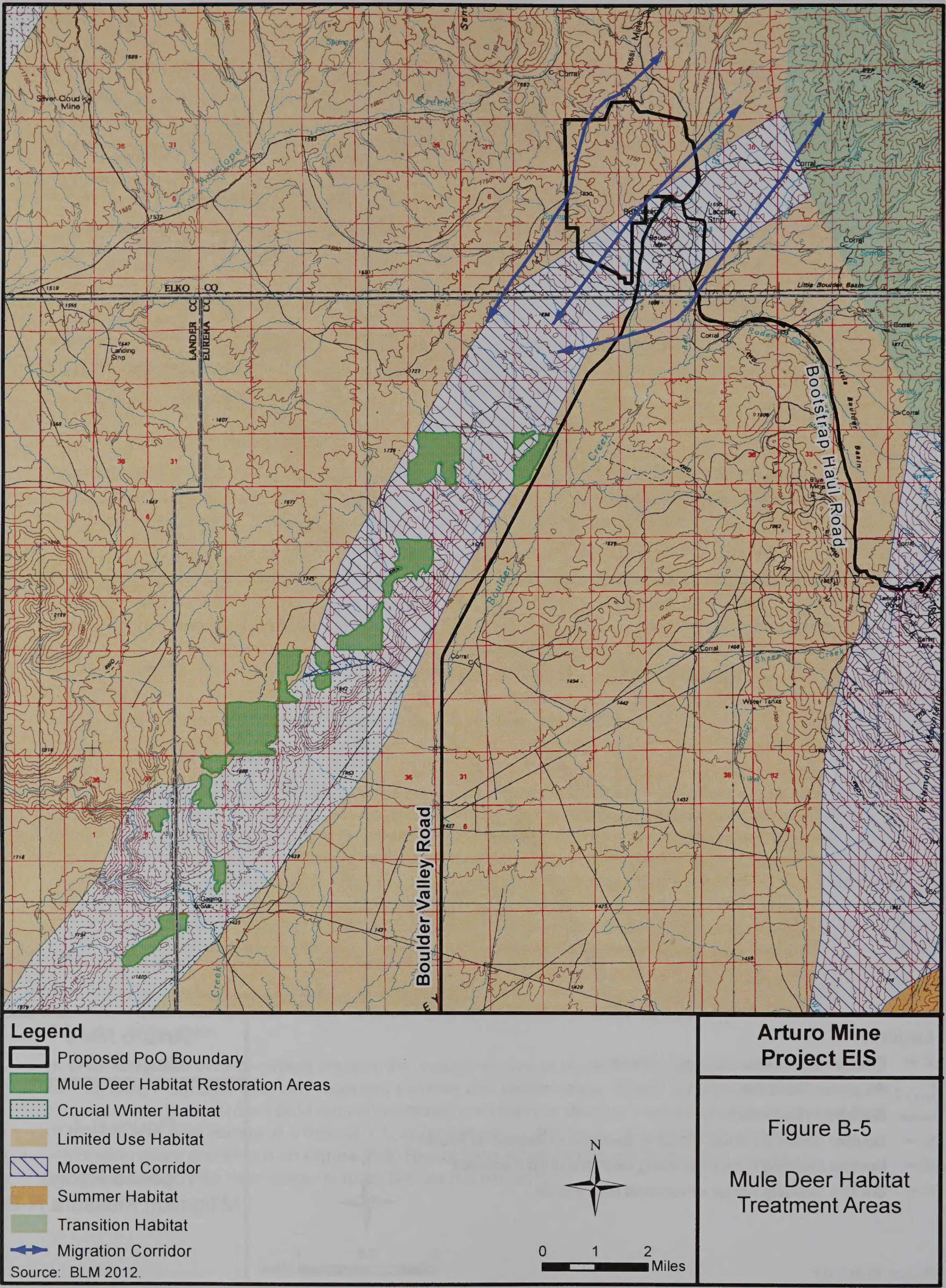


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Figure B-5

Mule Deer Habitat Treatment Areas

12/18/2013

- Seeding Treatments – Possible seeding treatments include broadcast and drag, drill, broadcast/aerial, harrow, disking, and hand.
- Mechanical Treatment – To provide for an adequate seedbed, mechanical treatments would include disking (plowing), harrowing and mowing of existing grasses.
- Livestock Grazing and Protective Fencing – Rest from livestock grazing until vegetation objectives are met.
- Herbicide Treatment – Appropriate BLM-approved herbicide treatments would be used to suppress non-native annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas.
- Prescribed Burn Treatment – Controlled burns would be used to reduce fuel, reduce litter to allow for better herbicide application effects, control competing vegetation, and improve wildlife habitat. Prescribed burns would be planned and implemented by BLM.
- Fire Break – Fire breaks would be created around each treated parcel using a combination of mowing and planting of forage kochia.

A Wildlife Working Group (WWG) would be established, made up of a representative from each of BDMV, BLM, and NDOW (collectively such representatives are referred to herein as the "Cooperators"). Additional representatives of the BLM, BDMV, and NDOW and others may participate in the WWG at the request of any member of the WWG or their supervisor. The initial three Cooperators are the points of contacts, however, each Cooperator or his/her supervisor may appoint a substitute Cooperator to participate in the WWG on such Cooperator's behalf. The WWG would meet once initially to finalize the location and specifics of the required habitat work and subsequently to review vegetation success and determine if any additional seedings would be required.

After appropriate seedbed preparation, areas would be seeded with the following seed mixtures as needed in **Tables B-2** and **B-3**.

Table B-2 Proposed Seed Mixes for Ground Seeding – Mule Deer Habitat

Species	Variety
Sandberg's Bluegrass (*Poa secunda* J. Presl)	Mountain Home
Russian Wildrye (*Psathrostachys juncea* [Fisch.] Nevski)	Bozoisky
Siberian Wheatgrass (*Agropyron fragile* ssp. *Sibericum* [Willd.] Melderis)	Vavilov
Crested Wheatgrass (*Agropyron cristatum* [L.] Gaertn.)	Nordan
Fourwing Saltbush (*Atriplex canescens* [Pursh] Nutt.)	Smoke Creek
Spiny Hopsage (*Grayia spinosa* [Pursh.] Guldenstaedt.)	N/A
Winterfat (*Krasheninnikovia lanata* [Moq.] D.Dietr)	N/A
Big Squirreltail (*Elymus multisetus* [J.G. Smith] Burtt-Davey)	Sand Hollow
Indian Ricegrass (*Oryzopsis hymenoides* [Roemer & J.A. Schultes] Ricker ex Piper)	Rimrock
Sainfoin (*Onobrychis viciaefolia* Scop.)	Eski

Table B-3 Proposed Seed Mixes for Aerial Seeding – Mule Deer Habitat.

Species	Variety
Wyoming Big Sagebrush (Artemisia tridentate ssp. wyomingensis)	N/A
Basin Big Sagebrush (Artemisia tridentata ssp. tridentate)	N/A
Western Yarrow (Achillea millifolium var. occidentalis DC)	N/A
Forage Kochia (Kochia prostrate [L.] Schrad.)	Immigrant

The desired outcome of the mitigation is to produce a functioning and sustainable habitat (based on plant density and diversity) for mule deer. The criteria best to fulfill this purpose is: 3 years after seeding, establishment of one seeded big sagebrush and 3 to 5 seeded grass or forb species per 1 square foot. If this criterion is not satisfied, Barrick will engage in re-seeding as noted below.

The use of prescribed burn and herbicide treatment prior to seeding with a drill (e.g Truax Drill), or broadcast seeder in addition to post-seeding seed incorporation equipment would be used to help increase success of habitat sustainability.

2.8.2.2 Monitoring

A quantitative monitoring program will document vegetation establishment progress. If vegetation establishment in a monitoring plot is not making progress towards the objectives, then the WWG will inspect the mitigation sites to document the extent of the problem and determine what actions shall be taken.

The monitoring approach will follow the methods presented by Herrick et al. (2005) with the establishment of monitoring and control plots. However, the monitoring and control plot transects will be established randomly, and will be verified in the field. If a site is found not to be acceptable because of unforeseen excessive disturbances such OHV travel, wild horse, or big game use then the original site would be rejected and another location selected from a pool of substitute sites for a specific stratification that were randomly selected for this purpose. The monitoring and control plots will be GPS located and the same plots will be surveyed throughout the monitoring program. However, if the plots at a monitoring site become unacceptable for continued monitoring because of some event such as flooding, excessive OHV travel, or wildfire then new plots would be established. If the plots cannot be successfully relocated then other options would be explored with the WWG. One such option would be monitoring site abandonment. The plot re-location discussion would take into account the number of years into the monitoring program and the status of the vegetation and soil in meeting the performance criteria. In addition, as plots reach the success criteria BDMV would not conduct further sampling of these plots.

A monitoring plot will be 100 x 35 meter (328 x 115 feet) or 100 x 59 meter (328 x 195 feet). The three transects in a monitoring plot will be randomly located based on the meter marks along a 100 meter metric tape. A transect will be located at a ninety degree angle to the 100-meter tape measure. The beginning and ending points will be GPS-located and marked with rebar. The same transects will be measured throughout the monitoring program. The control plots will also consist of three transects established in the same manner as the monitoring transects.

The line-point intercept method will be used to measure plant basal and foliar canopy cover, litter cover, bare ground, or biological soil crust cover at each meter mark along the transects (Herrick et al. 2005). These parameters are indicators of plant establishment and are important attributes to assessing revegetation success. The number of point intercepts will depend on the length of a transect.

A 1.0 x 1.0 meter quadrant will be randomly located three times along the line-point intercept transects. Meter marks along the tape measure would be used to randomly select the three plot locations. The 1-meter quadrant will be used to identify plant species and measure plant species density. The quadrant will be oriented to a transect by placing one corner at the randomly chosen meter mark with the other corner placed at the next-higher meter mark.

BDMV will follow the guidelines of Herrick et al. (2005) for determining appropriate number of transects and quadrants that are necessary at a monitoring site. Currently, three transects and nine 1-meter quadrants will be assessed at each sampling site. Data collected from the first survey period will be used to calculate the statistically robust number of transects and quadrants needed.

BDMV will use the data collected from the first year of monitoring to calculate the statistically robust number of monitoring sites and transects per site needed for later years.

Photographic documentation of vegetation along the transects will occur. A GPS-referenced digital photograph will be taken. The digital camera will be placed at the beginning of the transect and it will be focused along the length of the transect. Photograph identification cards will show site, transect number, date, direction, and crew number.

Cultural inventories and other preparatory work on a minimum of 45 percent or 626 acres would be completed within 1 year of signing the Record of Decision (ROD)/Plan Approval. Seeding of the 626 acres would occur within year 2. The remaining 55 percent of the area would be prepared and seeded within 6 years of signing the ROD/Plan Approval. Three years post seeding, the WWG would meet to assess habitat restoration success. If WWG determines that a functioning and sustainable habitat has been achieved then no further work would be required. If the WWG determines that seeding was only partially successful then up to but not to exceed 80 percent of the ground would be reseeded.

2.8.3 Effectiveness

Implementation of this mitigation measure would reduce project-related impacts to mule deer by restoring important winter range within the Cumulative Effects Study Area (CESA) for this species. The restoration monitoring program would gauge the effectiveness of treatments and mitigation measures and provide a basis for adjustment to the restoration plan if required to meet plan goals.

2.8.4 Resource Effects Analysis

The resource effects analysis for implementing this mitigation measure was presented in the Draft EIS in Section 3.17.4, Potential Monitoring and Mitigation Measures (pages 3.17-32 and 3.17-33).

2.9 Special Status Species

2.9.1 Potential Impact

The Project would remove or disturb greater sage-grouse Preliminary Priority Habitat (PPH). Important greater sage-grouse habitat in the Carlin Trend has been modified by large wildland fires that have converted sagebrush communities to a cheatgrass landscape, and by past and present mining operations. The implementation of the Project would further reduce important habitat for greater sage-grouse in the Carlin Trend.

2.9.2 Monitoring and Mitigation Measure SS-1

2.9.2.1 Mitigation

The Arturo Mine Project would impact 808 acres of PPH but would not impact Preliminary General Habitat. In order to reduce project-related impacts that would remove or disturb greater sage-grouse PPH, BDMV would restore important greater sage-grouse habitat located on BLM land. Land to be

reclaimed includes 808 acres onsite within the Arturo Plan of Operations boundary and approximately 1,616 acres (808 acres at a ratio of 2:1) of offsite mitigation for an overall total of 3:1 or 2424 acres. The public land recommended for offsite mitigation lies north of the project area as shown in **Figure B-6**.

Restoration activities that would be used to restore PPH include, but are not limited to:

- Seeding Treatments – Possible seeding treatments include broadcast and drag, drill, broadcast/aerial, harrow, disking, and hand.
- Mechanical Treatment – To provide for an adequate seedbed, mechanical treatments would include disking (plowing), harrowing and mowing of existing grasses.
- Livestock Grazing and Protective Fencing – Rest from livestock grazing until vegetation objectives are met.
- Herbicide Treatment – Appropriate BLM-approved herbicide treatments would be used to suppress non-native annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas.
- Prescribed Burn Treatment – Controlled burns would be used to reduce fuel, reduce litter to allow for better herbicide application effects, control competing vegetation, and improve wildlife habitat. Prescribed burns would be planned and implemented by BLM.
- Hand planting of sagebrush seedlings – In areas with an adequate understory of perennial grasses and forbs, sage brush seedlings would be planted.
- Fire Break – Fire breaks would be created around each treated parcel using a combination of mowing and planting of forage kochia.

A WWG would be established, similar to the WWG described under Section 2.8.2, Monitoring and Mitigation Measure WL-2. The WWG would be made up of a representative from each of BDMV, BLM, and NDOW. A representative from the Nevada Department of Conservation and Natural Resources may be included in the WWG at a later date. The WWG would establish and monitor sage grouse habitat restoration in conjunction with the mule deer meetings or by following a similar meeting schedule and technique.

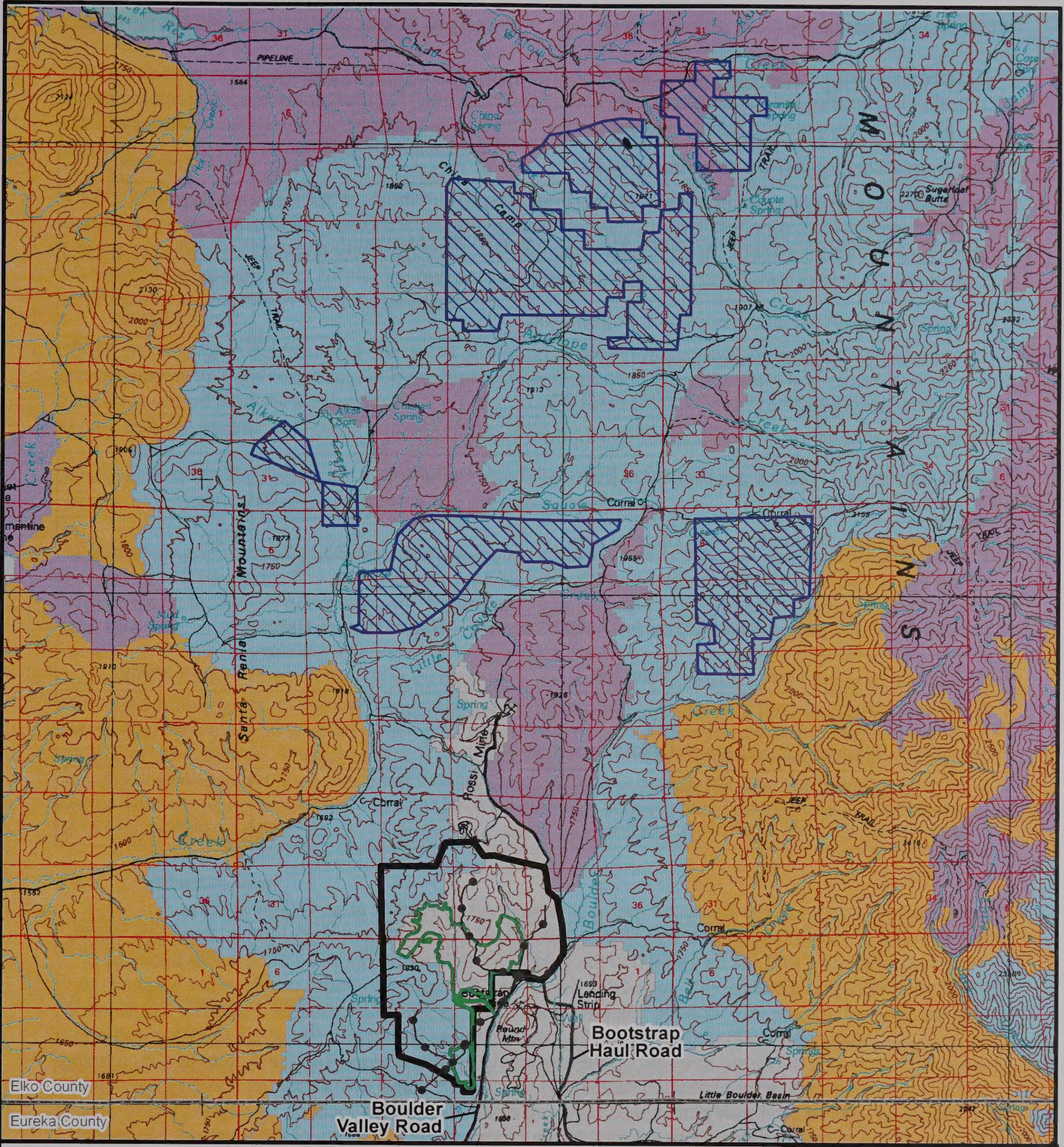
After appropriate seedbed preparation, areas would be seeded with the following seed mixtures as needed, as presented in **Tables B-4** and **B-5**.

In areas with an adequate understory of perennials forbs and grasses, sagebrush seedlings would be planted. The desired outcome is hand planting one "ten/ci" (or larger) sagebrush seedling on 10- to 20-foot centers (which equates to 218 to 435 plants/acre). If seeding efforts are considered instead of hand planting efforts, or as a combination with planting efforts, the use of a drill (e.g Truax Drill), or broadcast seeder with any needed pre-seeding seedbed preparation and post-seeding seed incorporation equipment would be used to help increase seeding success.

Success would be based on functionality and sustainability of sage grouse habitat. The criteria for successful habitat mitigation includes the following criteria: 3 years after seeding, verify establishment of one seeded big sagebrush and 3 to 5 seeded grass or forb species per 10 square feet. The use of prescribed burn and herbicide treatment prior to seeding with a drill (e.g Truax Drill), or broadcast seeder in addition to post-seeding seed incorporation equipment would be used to help increase seeding success. If this criterion is not satisfied, Barrick will engage in re-seeding as noted below.

2.9.2.2 Monitoring

A quantitative monitoring program will document vegetation establishment progress. If vegetation establishment in a monitoring plot is not making progress towards the objectives, then the WWG will inspect the mitigation sites to document the extent of the problem and determine what actions shall be taken.



Legend

- Proposed PoO Boundary
- Proposed Power Transmission Line
- Existing Reclaimed Disturbance
- PPH - Essential/Irreplaceable Habitat (NDOW Category 1)
- PPH - Important Habitat (NDOW Category 2)
- PGH - General Habitat (NDOW Categories 3 and 4)
- Non-habitat
- Greater Sage-grouse Habitat Restoration Areas

Source: NDOW 2012.

N

0 0.75 1.5 Miles

Arturo Mine Project EIS

Figure B-6

Greater Sage-grouse Treatment Areas

8/8/2013

Table B-4 Proposed Seed Mixes for Ground Seeding – Sage Grouse Habitat

Species	Variety
Sandberg's Bluegrass (*Poa secunda* J. Presl)	Mountain Home
Russian Wildrye (*Psathrostachys juncea* [Fisch.] Nevski)	Bozoisky
Siberian Wheatgrass (*Agropyron fragile* ssp. *Sibericum* [Willd.] Melderis)	Vavilov
Crested Wheatgrass (*Agropyron cristatum* [L.] Gaertn.)	Nordan
Fourwing Saltbush (*Atriplex canescens* [Pursh] Nutt.)	Smoke Creek
Spiny Hopsage (*Grayia spinosa* [Pursh.] Guldenstaedt.)	N/A
Winterfat (*Krasheninnikovia lanata* [Moq.] D.Dietr)	N/A
Big Squirreltail (*Elymus multisetus* [J.G. Smith] Burtt-Davey)	Sand Hollow
Indian Ricegrass (*Oryzopsis hymenoides* [Roemer & J.A. Schultes] Ricker ex Piper)	Rimrock
Sainfoin (*Onobrychis viciaefolia* Scop.)	Eski

Table B-5 Proposed Seed Mixes for Aerial Seeding – Sage Grouse Habitat

Species	Variety
Wyoming Big Sagebrush (*Artemisia tridentate* ssp. *wyomingensis*)	N/A
Basin Big Sagebrush (*Artemisia tridentata* ssp. *tridentate*)	N/A
Western Yarrow (*Achillea millifolium* var. *occidentalis DC*)	N/A
Forage Kochia (*Kochia prostrate* [L.] Schrad.)	Immigrant

The monitoring approach will follow the methods presented by Herrick et al. (2005) with the establishment of monitoring and control plots. However, the monitoring and control plot transects will be established randomly, and will be verified in the field. If a site is found not to be acceptable because of unforeseen excessive disturbances such OHV travel, wild horse, or big game use then the original site would be rejected and another location selected from a pool of substitute sites for a specific stratification that were randomly selected for this purpose. The monitoring and control plots will be GPS located and the same plots will be surveyed throughout the monitoring program. However, if the plots at a monitoring site become unacceptable for continued monitoring because of some event such as flooding, excessive OHV travel, or wildfire then new plots would be established. The plot re-location discussion would take into account the number of years into the monitoring program and the status of the vegetation in meeting the performance criteria. In addition, as plots reach the success criteria BDMV would not conduct further sampling of these plots.

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The line-point intercept method will be used to identify plant species and measure plant species density at each meter mark along the transect (Herrick et al. 2005). These parameters are indicators of plant establishment and are important attributes to assessing revegetation success. The number of point intercepts will depend on the length of a transect.

A 1.0 x 1.0 meter quadrant will be randomly located three times along the line-point intercept transects. Meter marks along the tape measure would be used to randomly select the three plot locations. The 1-meter quadrant will be used to identify plant species and measure plant species density. The quadrant will be oriented to a transect by placing one corner at the randomly chosen meter mark with the other corner placed at the next-higher meter mark.

BDMV will follow the guidelines of Herrick et al. (2005) for determining appropriate number of transects and quadrants that are necessary at a monitoring site. Currently, three transects and nine 1-meter quadrants will be assessed at each sampling site. Data collected from the first survey period will be used to calculate the statistically robust number of transects and quadrants needed.

BDMV will use the data collected from the first year of monitoring to calculate the statistically robust number of monitoring sites and transects per site needed for later years.

Photographic documentation of vegetation along the transects will occur. A GPS-referenced digital photograph will be taken. The digital camera will be placed at the beginning of the transect and it will be focused along the length of the transect. Photograph identification cards will show site, transect number, date, direction, and crew number.

Cultural inventories and other preparatory work on a minimum of 45 percent or 727 acres would be completed within 1 year of signing the ROD/Plan Approval. Seeding of the 727 acres would occur within year 2. The remaining 55 percent of the area would be prepared and seeded within 6 years of signing the ROD/Plan Approval. Three years post seeding, the WWG would meet to assess habitat restoration success. If WWG determines that a functioning and sustainable habitat has been achieved then no further work would be required. If the WWG determines that seeding was only partially successful then up to but not to exceed 80 percent of the ground would be reseeded.

2.9.3 Effectiveness

Implementation of this mitigation measure would reduce project-related impacts to sage-grouse by restoring important greater sage-grouse habitat within the CESA for this species.

2.9.4 Resource Effects Analysis

The resource effects analysis of implementing Mitigation Measure SS-1 was described in Section 3.18.4, Potential Monitoring and Mitigation in the Draft EIS (page 3.18-24).

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